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Sustainable Directions in Tourism

Edited by

Tomás F. Espino-Rodríguez

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Sustainable Directions in Tourism

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Special Issue Editor

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About the Special Issue Editor

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Article

How Physical Environment Impacts Visitors' Behavior in Learning-Based Tourism—The Example of Technology Museum

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Abstract: Visiting a museum is a popular activity in the tourism industry, especially in cultural and learning-based tourism. To help plan museums effectively, this study investigated the underlying motivations and constraints and their impact on the perceived physical environment and visitor satisfaction toward a museum. The results suggest that the physical environment of museums serves as an axial mediator among motivations, constraints and visitor satisfaction. Six essential factors of physical environment are affected by motivations and constraints, further affecting visitor satisfaction in various patterns, in which architectural planning, exhibition, external environment, and entrance are clearly affected by basic motivations and constraints. Under motivations, family education and self-development are the most two profound influences on enhancing visitor satisfaction through the physical environment. Shops and café are worth special attention in meeting motivation of attractiveness, occasion and social interaction. The results could support the planning and design of a satisfactory museum.

Keywords: learning-based tourism; science museum; motivation; constraint; museum planning; physical environment (PhE); visitor behavior; visitor satisfaction

1. Introduction

In recent years, the role of the modern museum has transformed from the traditional functions of collection, exhibition and research into an emphasis on leisure, education, aesthetic experiences and entertainment [1–3]. On the other hand, a museum may have something different to offer from other leisure and tourism products, through unique features such as outdoor exhibitions or cultural learning experiences [4]. Economic, cultural and social demands also push museums to deal with the issues of visitor experience and profitability [3]. To create a pleasant museum experience, museum planners and managers must pay considerable attention to visitor satisfaction and service quality [5]. The latter has always been regarded as key to gaining a competitive edge in the service industry [6]. However, it is impractical to use the conventional generic assessment scale for service quality to evaluate individual satisfaction and quality of physical environment in a modern museum [7].

As museum managers tackle challenges emerging from limited resources and budget, they have to develop effective strategies to improve the museum's performance and visitor satisfaction in order to compete with other museums and leisure activities [8]. Tourists' choice of destination is driven by a variety of factors, such as the potential to learn, the diversity of facilities, the aesthetic experience, and the quality of environment [9]. Hence, to improve the museum services, it is important to understand the market responses [1,2,10,11], namely, what affects visitors' decision to visit or not

and how they evaluate the services delivered by the museum. Visitors' interest (e.g., motivation and perception) as well as the information provided by the museum (e.g., collection, exhibition and events) are key topics in the performance of a museum [12].

With this background, this study set out to meet three objectives: (1) identify the motivations and constraints that influence the decision to visit a museum; (2) suggest a demand-based list of physical environment which affect visitor satisfaction; and (3) construct a causal relationship among visitors' interests, physical environment, and visitor satisfaction as a whole.

2. Literature Review

2.1. Motivations to Visit a Museum

Understanding the motivation behind museum visits is essential for the planning, promotion, and pricing of the attractions [13]. Motivation has been characterized as a goal- and value-driven behavior, which can be grounded in biology, or a complex interaction with external stimuli that trigger various individual activities to accomplish a specific goal [14,15]. Derived from different orientations of human psychology theory, two distinct types of motivations have been identified to determine an individual's cognitive and affective responses, namely intrinsic and extrinsic motivations [16,17]. The former involves one's internal feelings, such as feeling interested or enjoyable, while the latter involves external incentives and interactions. Similar to intrinsic and extrinsic motivations, another taxonomy applied to travel choices is push and pull motivations [18–21]. Push motivations are driven by personal and internal psychological forces such as emotion and cognition, while pull motivations are associated with the features of the destination choices [21]. Previous studies indicate that motivations that drive visitors to museums include education, leisure, friends, work, physical facilities, and escapism [22–25], within which visitors seek to satisfy not only one objective but a variety of leisure incentives [26]. To regular visitors, experiencing the entire museum environment is more appealing than the collections within the museum [27]. Here, motivation is guided by neither internal nor external forces and is mostly self-oriented. Widely-used scales for quality of service may exclude some critical factors that also influence one's choice of destination, such as the reputation of attractions, perceived entertainment, and the cultural experience [28].

Researchers have not reached a consensus on how to classify the motivations to visit a formal or informal place [29–31], but they continue in the efforts to understand the reasons behind an individual's decision on whether to visit a museum [32].

2.2. Constraints to Visiting a Museum

From the socio-psychological perspective, motivations can be divided into factors of seeking and avoidance [33]. Hence, it is also essential to pay attention to the negative aspect of human psychology. Constraints, as opposed to motivations, hinder people's decision to visit a place, and have been the subject of another stream of research [34–39] which explores intrapersonal (lack of interest), interpersonal (lack of company) and structural factors (lack of time, high cost, crowding, dissatisfaction with or unattractiveness of the destination environment) [40–42]. Among them, intrapersonal and structural constraints affect visitors' intention significantly, while interpersonal ones do not [41].

Constraints are not necessarily barriers to leisure participation because people negotiate them [43–46] using various strategies [47,48]. Self-efficacy [49], social capital and motivation are factors affecting the negotiation and relative strategies [50].

Constraints that influence people's decision to visit a museum may comprise psychological and situational factors, as well as those attributed to the museum itself. Factors such as individual psychological status, preference, socioeconomic status, and interpersonal relationship are not dictated or controlled by the museum environment or staff. Other factors, such as promotion, image of the museum, the quality of service, and physical facilities can be manipulated and controlled by the museum, which should have been addressed through planning or management to reduce

constraints during the visitors' museum experience. Although much research has been dedicated to the investigation of leisure constraints, few studies concurrently probe the effect of leisure constraints and motivation factors. To obtain a holistic view of the human decision-making process, researchers should not eliminate the constraining factors as determinants of human behavior.

2.3. Museum Physical Environment (PhE) and Service Quality

Physical environment (PhE) of a museum have not been widely discussed in marketing research. Researchers initially defined and identified the distinct features of service quality [51,52], followed by either verifying the measurement of service quality [52–57] or extending its relationship with antecedent and subsequent constructs, such as motivation [18,19,21,58,59], value [54,60–62], and satisfaction [63–67].

In marketing practice, service quality has been affirmed as an influencing factor to customers' evaluation and intention to maintain a relationship with business vendors [68]. Through the attainment of customer satisfaction and repeat purchase, companies obtain sustainable advantages over their competitors [51]. Zeithaml [62] defined perceived quality as "the consumer's judgment about a product's overall excellence or superiority." Researchers argue service quality is largely dependent upon the cognitive gap between expected and perceived performance [69]. The measurement of service quality is thus assessed by the difference between the two and mostly relies on customers' subjective and cognitive judgment [70]. Service quality is also evaluated by the level of service fulfillment between customers' expectation and perceived service delivery [71].

Due to difficulties in obtaining objective data on the standard of service and making a comparison between expectation and performance at the same time, most studies apply perceived service quality as the major determinants of behavioral consequences in their frameworks [72,73]. Referring to Swan and Combs's performance-based model [74], people may perceive both technical quality and functional quality during the delivery of service and consequently form an overall evaluation of service quality [72]. Besides, using only a performance scale to measure the construct of service quality yielded better analytical results than a comparative measurement of expectation versus perceived performance [55]. In studying leisure and tourism, researchers argue it is not precise enough to rely on only service quality scales [52] to study individual perception of service quality. Instead, it is necessary to evaluate the overall experience [7,73,75–77]. Acknowledging inconsistent results from different service quality measures, researchers engaged in leisure and tourism studies are inclined to develop their own quality constructs based on perception of service features and emotional experiences [75].

Physical environment (PhE) can be a constraint as well as an attraction for visitors. Hence, to better predict visitors' decision on whether to visit a museum, the service quality of the museum in this study is measured by using visitors' evaluation and perception of the quality of a museum's PhE. To probe the service factors of a museum, the construct "physical environment (PhE)" herein is defined as the service functions embedded in the museum's facilities, including both internal/external environment and information/exhibition, which can be perceived and evaluated by visitors.

2.4. Visitor Satisfaction

Cardozo [78] first introduced the concept of customer satisfaction into marketing research and concluded high customer satisfaction increases people's purchase intention, possibly extending it to other similar products or contributing to enhanced reputation through word-of-mouth. Consequently, marketing researchers have devoted efforts to formulate definitions of customer satisfaction [70,79–81].

Satisfaction may be represented by different models, such as individual psychological expectation-disconfirmation [82] (CS/D), expectation-desire congruency [83], equity [84], norm [85], and performance [86]. Satisfaction can be generally divided into feature satisfaction and information satisfaction [66]. Feature satisfaction refers to the consumer's subjective judgment based on the performance of the product features [87]. Information satisfaction, on the other hand, refers to the

consumer's subjective judgment of information in choosing a product, which is outside the focus of this study.

Customer satisfaction can be established through a series of customer evaluations and comparison between their expectation and perceived performance in their use of a product or service. The service quality can be perceived differently based on the quality of product features or psychological outcome. Leisure satisfaction can be measured by how well leisure activities are perceived to fulfill the basic needs and motives that stimulated the desire to participate in an activity [76]. In the museum context, satisfaction can be evaluated via a visitor's experience in and perception of the museum environment within a certain period, e.g., during the museum visit. Museum visitors perceiving high quality and full satisfaction with the physical environment are more likely to recommend the museum to their friends or disseminate favorable comments to others [28]. Based on these notions, customers' satisfaction in museum services should be derived from their experience of a museum's facilities, functional services, and surroundings. Hence, the study concentrates on visitors' satisfaction with the performance of physical environment.

2.5. Links between Motivation, Constraint, Physical Environment, and Visitor Satisfaction

In the research of service marketing, especially in tourism, customer satisfaction is critical to both business practice and academic interest. Researchers have agreed visitor satisfaction is affected by his or her motivations [88]. Established motivations include seeking variety from the daily routine, recreational opportunities, and leisure experiences [88]. Tourists may share similar patterns of motivation and satisfaction, such as knowledge seeking, social interaction, and escape [89]. Such similarity between motivation and satisfaction may lead to high overall satisfaction [21,90]. Contrary to motivations, visit constraints have not been a major focus of investigation in marketing and management studies [32]. As a negative influence on the willingness to visit a museum, we can expect constraints to influence satisfaction negatively. A combination of various determinants of visitor satisfaction, including motivations and constraints, works together to influence the decision to visit a destination. Aside from museums, prior research on other destinations has also favored an approach that combines motivations and constraints because it provides a holistic view of individual decisions [91]. However, the causal relationship between the role of physical environment, motivations, constraints and satisfaction have been rarely explored. While past discussions focus on the linear relationship between service quality and individual satisfaction, the objective of this study was to delineate multiple factors of motivations, constraints and physical environment that influence one's satisfaction after a museum visit.

2.6. The Hypothetical Model

Previous studies reveal individual satisfaction is affected by one's motivations [21,88,89] and is mediated by performance-based service quality [65–67,72,75,92]. Researchers have focused on either verifying the causal relationship between service quality and customer satisfaction or confirming the link between individual motivations and satisfaction. Little has been done that postulates a causal relationship between individual motivations, constraints, facility features and satisfaction in a museum context. In this study, motivations and constraints are hypothesized to influence visitor satisfaction in their visit as mediated through their perception of the museum physical environment (Figure 1).

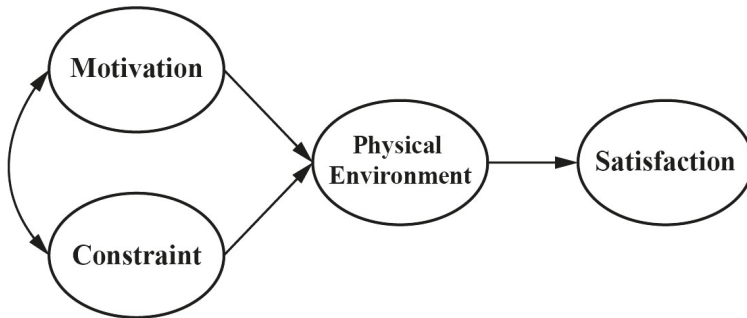


Figure 1. Proposed model on the relationship among motivations, constraints, physical environment of a museum and satisfaction.

3. Methods

3.1. Design of Questionnaire

A survey questionnaire was used as the instrument of study. The questions were designed based on literature review and were pre-tested to ensure satisfactory content validity [93]. The questionnaire comprised four sections, each measuring one of the four study constructs. All constructs were measured on a five-point Likert scale ranging from strongly disagree (=1) to strongly agree (=5). Demographic variables, i.e., age, gender, education, income, and marital status, were also investigated at the end of the questionnaire.

3.2. Measurement of the Study Constructs

Visitors' motivations were examined as factors that drive individuals' decision to visit a museum, with five sub-constructs: learning, leisure/entertainment, environment, social interaction, and promotion [23,94]; there is a total of 24 items (Appendix A, A1–A24). Constraints, on the other hand, were treated as negative influences that hinder individuals' decision to visit a museum. The constraints comprise 21 items (Appendix A, B1–B21).

For the assessment of physical environment (PhE), we developed a questionnaire to evaluate people's perception and experience in a museum context, done by synthesizing characteristics from previous studies and common planning features (e.g., a museum's image, open space, environment, displays, activities and service facilities). Thirty-four items were utilized to measure the PhE of a museum (Appendix A, C1–C34).

Positive recommendation and revisit intention are considered as behavioral responses of visitor satisfaction. For satisfaction measurement, this study rated visitors' attitudinal and behavioral responses by overall perception of their experience encounters during the time spent within the museum environment. The intention to revisit is another behavioral response that is commonly used in leisure and tourism studies to describe a visitor's psychological commitment to and preference for a place (or product) [21]. This study measured visitor satisfaction with three items, i.e., overall satisfaction with the museum, possibility of a re-visit, and intention to recommend the museum to friends or acquaintances (Appendix A, D1–D3).

3.3. Survey Site and the Survey

The survey was conducted on the National Science and Technology Museum (NSTM) in Kaohsiung, Taiwan. Opened in 1997 and employing 133 staffs, the museum has a total floor area of 20,756 m² and a site area of 19.16 ha. It contains 18 permanents and 3 special exhibitions (Figure 2). Kaohsiung is a major industrial city in Taiwan, and NSTM is the first museum of applied science in Taiwan. Unlike most museums of art or history, the aim of NSTM is on industrial development and

daily applications of science and technology. The exhibition is tailored closely to people's lives. This study covers the whole of the museum's environment and facilities as well as services given by all staff members.

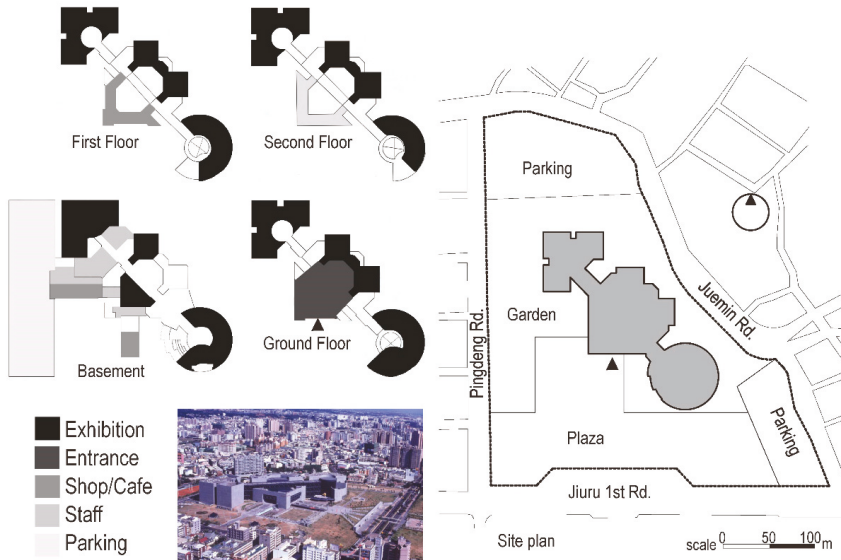


Figure 2. Site plan and major floor plans of the National Science and Technology Museum.

NSTM visitors were recruited for the survey. Data were collected through questionnaires conducted in the museum lobby while visitors complete their visits. Trained investigators explained to the participants the objective of the study, and the participants completed the questionnaire on a self-report basis. The investigators stayed in the lobby and responded to questions from the participants if they had any. When the questionnaire was completed, the participants would receive a small souvenir as requital for their participation. It took six days, which were mostly Saturdays or Sundays, to complete the survey. The questionnaires were distributed between 10:00 and 16:00 while the museum was open. To explore visitor behaviors, which are closer to actual tourism comparing to that of young pupils obligated to visit the museum for their homework, visitors younger than 15 were excluded from the survey, and 405 questionnaires were collected.

3.4. Analytical Process

Exploratory factor analysis (EFA) was used to identify the underlying factors of motivations, constraints, and the physical environment (PhE). Before EFA, item analysis was performed to raise the consistency and stability between multiple items of each construct. Barlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were employed to determine the fitness of the factor analysis. Cronbach's alpha values were calculated to determine the reliability of each identified factor [95]. Factor analysis contributes to an understanding of the underlying latent construct and has been favored by researchers who wish to classify a mix of research items into groups of influential factors [21,32,96–98].

After EFA, the properties of the four research constructs—motivations, constraints, PhE and visitor satisfaction—were examined using structural equation modeling (SEM) [99] together with a two-stage testing process [100]. The validity of the measurement models was first tested to determine how measured variables logically and systematically represent the four constructs involved in the

proposed model [95]. Then, a series of structural equation modeling (SEM) tests were run to estimate the structural model [95].

Finally, multiple regression was conducted to find the motivated and constrained determinants of perceived PhE for each factor extracted by EFA.

4. Results and Discussion

4.1. Sample Profile

In total, 405 questionnaires were distributed at the information desk of the museum. Forty-four responses were incomplete (e.g., over 1/3 of the questions unanswered or the same answers repeated in an entire section) and were excluded from the sample data. The final sample contained 361 questionnaires on which data analysis was conducted.

The demographic results of the survey indicate slightly more female visitors than male. Most of the visitors were between the age of 20 and 44 (72.5%) and have a college degree (61.7%); students accounted for a large proportion (Table 1).

Table 1. Demographic characteristics of the sample

	Percentage		Percentage
Gender		Occupation	
Male	48.1	Self-employed	1.9
Female	51.9	Blue-collar worker	6.6
		White-collar worker	14.2
Age		Technical worker	16.1
15–19	13.3	Government worker	17.7
20–24	24.7	Student	35.8
25–34	20.3	Retiree	7.9
35–44	27.5	Others	1.9
45–54	10.1		
55–64	3.5	Monthly income	
65+	0.6	<NTD10,000	35.1
		NTD10,000–30,000	22.2
Educational Level		NTD30,000–50,000	25.3
Junior high	0.9	NTD50,000–70,000	13
High school	19.6	NTD70,000–90,000	2.2
College	61.7	NTD90,000–110,000	1.3
Graduate	17.7	Above NTD110,000	0.9
Marital status			
Single	53.8		
Married with children	38.3		
Married without children	7.9		

Note: NTD is the abbreviation for New Taiwan Dollar.

4.2. Sample Profile

Both Kaiser–Meyer–Olkin measure of sampling adequacy (>0.8) and Bartlett Test of Sphericity ($p < 0.05$) were used to assess whether the sample data were appropriate for conducting factor analysis. The results show motivations, constraints, and PhEs satisfy the assumptions in the factor analysis. Factors were extracted if their eigenvalues (or latent roots) were larger than 1. Rotated items with low communality (factor loading < 0.40) or cross-loaded items were excluded. Finally, the factor structure for three constructs were confirmed and labeled (Appendix B, Table 2). Note that factor analysis was not performed for the construct “satisfaction” because it only has three items.

Table 2. Factors under the motivation (Mo), constraint (Con), physical environment (PhE) and the explained variances of the three constructs.

Construct	Factor	Explained Variance (%)	Total Variance Explained (%)
Motivation (Mo)	Mo1 Self-development	20.69	61.47
	Mo2 Occasion and social interaction	14.48	
	Mo3 Leisure and companionship	12.32	
	Mo4 Family education	7.67	
	Mo5 Attractiveness or obligation	6.32	
Constraint (Con)	Con1 Poor museum image	28.66	63.43
	Con2 Unappealing soft content	20.10	
	Con3 Unattractive service and cost	14.67	
Physical Environment (PhE)	PhE1 Architectural planning	15.44	64.27
	PhE2 Exhibition and marketing	15.23	
	PhE3 External environment and accessibility	12.02	
	PhE4 Entrance and ticketing	9.03	
	PhE5 Site planning	6.99	
	PhE6 Shop and café	5.57	

This study extracted five factors from motivations to visit a museum, in which “self-development” (Mo1) is the strongest. Among them, “self-development” (Mo1), “occasion and social interaction” (Mo2), and “family education” (Mo4) are intrinsic, and “leisure and companionship” (Mo3) and “attractiveness or obligation” (Mo5) are extrinsic. “Leisure and companionship” (Mo3) and “occasion and social interaction” (Mo2) were established as motivations to visit a museum, which is consistent with prior research [10,94]. In recent years, the managerial philosophy of museums has undergone major changes, evolving from a historical role of collection and research into a competition for visitor attendance [5]. Visitors find it important to have a setting that makes them feel comfortable and at ease when deciding if a museum is where they want to spend their leisure time [101]. A museum’s attractiveness (Mo5), such as its architecture and admission cost, was also found to be an effective motivation for visiting and crucial in meeting visitors’ needs.

This study draws three factors from constraints which hinder people’s willingness to visit the museum. All of them are structural constraints rather than personal or intrapersonal [35]. This suggests structural constraints are reasons hindering museum visits. Contrary to motivation, constraints toward visiting a museum are more extrinsic, while motivation to visit a museum is more intrinsic. What is noteworthy is “poor images of the museum” (Con1), rather than “unappealing soft content” (Con2), is the strongest factor hindering museum visits. That indicates the importance of the images in a museum. Another effective constraint to visiting a museum found in this study was “unattractive service and cost” (Con3), consisting of both admission charges and psychological efforts [102]. In line with prior assumptions, visitors weigh costs against the learning and recreational value they receive from the environment of a museum and the visit in general, and this assessment ultimately affects their level of satisfaction [103,104].

The study further suggests physical environment (PhE) possesses six main factors which affect visitors’ satisfaction: “architectural planning” (PhE1), “exhibition and marketing” (PhE2), “external environment and accessibility” (PhE3), “entrance and ticketing” (PhE4), “site planning” (PhE5), and “shop and café” (PhE6). It is to be noted that “shop and café” (PhE6) stands for one of the crucial elements for visiting museum, and therefore it is extracted as an independent factor.

4.3. Structural Model of Proposed Visiting Behavior

After confirming the interrelationship between the observed indicators, a confirmatory factor analysis (CFA) was conducted to evaluate the reliability and validity, and the relationship between

the research constructs was redefined before the measurement and structural equation models were examined [100]. The reliability of the construct, which captures the degree to which a set of measures indicate the common latent construct, was tested by using the method proposed by Fornell and Larcker [105]. With CFA, the average variance extracted (AVE) of each construct (i.e., motivations, constraints, physical environment and satisfaction) was examined. The convergent validity is acceptable with the motivation value slightly under 0.50 [106], and the composite reliability (CR) for the four constructs are well within acceptable values for the criterion of reliability (>0.70) [107,108] (Table 3). The discriminant validity was also tested by comparing the average of variance extracted (AVE) and squared correlation (χ^2) among the constructs. The results show no correlation is larger than the average of variance, which confirms the discriminant validity [105] of the three constructs is also satisfactory (Table 4). After verifying different validity and reliability criteria, the construct validity for applying the research instrument in this study is determined acceptable.

Table 3. Convergent validity of the measurement models.

Construct/Indicator	Factor Loading (λ)	Reliability Coefficient (λ^2)	Measurement Error ($1-\lambda^2$)	AVE	CR
Motivation (Mo)				0.416	0.778
Mo1	0.734 ^a	0.539	0.461		
Mo2	0.502***	0.252	0.748		
Mo3	0.635***	0.403	0.597		
Mo4	0.67***	0.449	0.551		
Mo5	0.661***	0.437	0.563		
Constraint (Con)				0.679	0.862
Con1	0.858 ^a	0.736	0.264		
Con2	0.923***	0.852	0.148		
Con3	0.671***	0.450	0.550		
Physical environment (PhE)				0.557	0.881
PhE1	0.899 ^a	0.808	0.192		
PhE2	0.832***	0.692	0.308		
PhE3	0.644***	0.415	0.585		
PhE4	0.777***	0.604	0.396		
PhE5	0.706***	0.498	0.502		
PhE6	0.569***	0.324	0.676		
Satisfaction (S)				0.684	0.882
S1	0.662 ^a	0.438	0.562		
S2	0.891***	0.794	0.206		
S3	0.905***	0.819	0.181		

Note: ^a Significance was not calculated because the unstandardized loading was set as 1.0 to fix construct variance.
*** $p < 0.001$.

Table 4. Discriminant validity of the measurement models.

	Motivation (Mo)	Constraint (Con)	Physical Environment (PhE)	Satisfaction (S)
Motivation (Mo)	0.416 ^a			
Constraint (Con)	0.013 ^b	0.679 ^a		
Physical environment (PhE)	0.189 ^b	0.064 ^b	0.557 ^a	
Satisfaction (S)	0.142 ^b	0.027 ^b	0.333 ^b	0.684 ^a

Note: ^a Average variance extracted (AVE). ^b Squared correlation (γ^2).

The measurement model consists of two exogenous variables (i.e., motivations and constraints) and two endogenous variables (i.e., physical environment and visitor satisfaction). The proposed model revealed an acceptable data fit ($\chi^2 = 267.434$, $df = 113$, $\chi^2/df = 2.367$, CFI = 0.940, IFI = 0.940, NFI = 0.901, GFI = 0.910, RMSEA = 0.066), indicating the proposed model adequately explains the empirical relationship between the study variables. Though χ^2 is significant, which is sensitive to the sample size, the fit is deemed acceptable as χ^2/df is less than 3 [109], and incremental indices (over 0.90. RMSEA ranging from 0.6 to 0.8) also indicate the model fits the data well [110].

The goodness-of-fit was assessed to evaluate the validity of the structural model [95]. The indices demonstrate a good fit for the structural model ($\chi^2 = 267.54$ with 114 degrees of freedom, CMIN/DF (CN; χ^2/df) = 2.347. GFI = 0.909, AGFI = 0.879, RMR = 0.030, RMSEA = 0.065, NFI = 0.901, IFI = 0.941, CFI = 0.940, PNFI = 0.75, PNFI = 0.755). The path analysis of the structural model shows the relationship between visitors' motivations and constraints was insignificant ($r = -0.12$ and $p = 0.088$). This result is reasonable as the two are counter but independent effects in determining visitors' experience and response. The causal link between determinants and physical environment is moderately strong and significant. The path coefficients from motivations and constraints to perceived quality of physical environment (PhEs) are 0.41 ($t = 5.54$, $p < 0.000$) and -0.21 , respectively ($t = -3.38$, $p < 0.000$) (Figure 3). Therefore, the motivation effect is shown to overpower the constraint effect in determining the perception of physical environment after a visit. Furthermore, the path coefficient between PhEs and visitor satisfaction is 0.51 ($t = 6.79$, $p < 0.000$). Motivations also appear to have a direct effect on satisfaction with an impact of 0.16 ($t = 2.39$, $p = 0.017$), and an indirect effect of 0.21 through physical environment (Table 5). The two determinants, motivations and constraints, explain 23.1% variance in quality of physical environment and the three constructs explain 35.3% variance in visitor satisfaction.

Table 5. Direct and indirect effects among motivation, constraint, physical environment and satisfaction.

Path	Direct Effect	Indirect Effect	Total Effect
Motivation → Physical environment	0.411		0.411
Constraint → Physical environment	-0.207		-0.207
Physical environment → Satisfaction	0.509		0.509
Motivation → Satisfaction	0.156	0.209	0.365
Constraint → Satisfaction		-0.105	-0.105

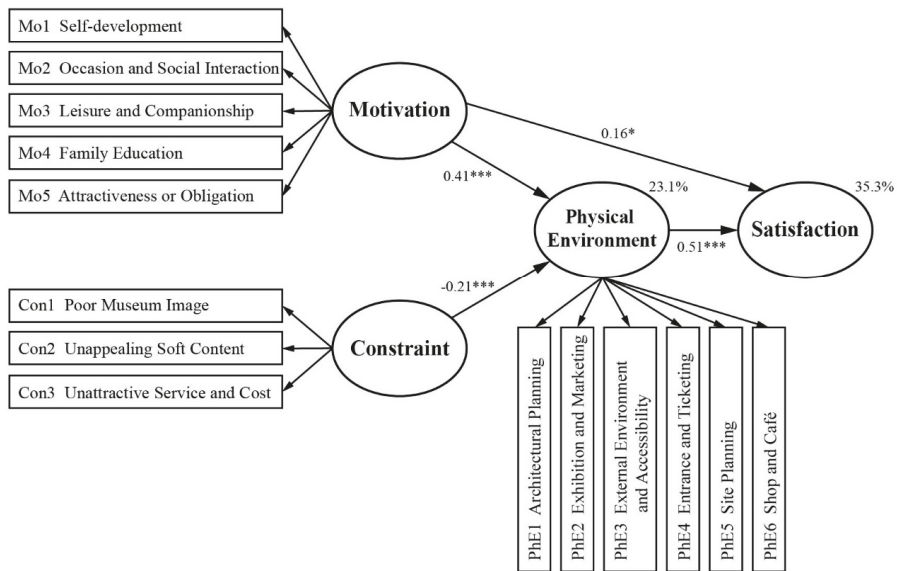


Figure 3. Estimated results of the study model. Physical environment forms a mediator among motivation, constraint and satisfaction. * $p < 0.05$, *** $p < 0.001$.

This study posits a structural model in which motivations and constraints have a mediating effect on visitor satisfaction through physical environment (PhE). The PhE partially mediate the path from motivations to satisfaction, in which the direct effect of motivations on satisfaction is 0.16 and the indirect effect mediated through PhE is 0.21, which is actually stronger than the direct one (Table 5). Therefore, the path mediated by physical environment may be deemed more important than the direct one.

The strong effect size of physical environment on visitor satisfaction (Table 5 and Figure 4) is consistent with previous theoretical results in which service quality is shown to be a vital determinant of individual satisfaction [21,28,66,67,111]. This result highlights the influence of physical environment on satisfaction. An individual's perception of a museum is derived from the evaluation of how well it performs on its various physical environment, such as exhibition environment, exhibition format, staff service and transportation, while the high level of satisfaction expressed by visitors who think the museum performed well in the quality of its physical environment confirms the theoretical assumption that the physical environment positively influence visitors' attitudinal and behavioral responses. The strength of the two explained variances in the model is also noteworthy. Motivations and constraints explain as high as 23.1% variance in the quality of physical environment, indicating careful consideration should be given to visitors' motivations and constraints in planning or managing a museum. As for visitor satisfaction, motivations, constraints and physical environment, they explain 35.3% of its variance. That is to say, over one third of visitor satisfaction can be achieved by paying more attention to motivations, constraint, and physical environment. In addition, though the effect of motivations on satisfaction is less than physical environment on satisfaction (0.51), motivations still have a relatively strong total effect (0.37) due to its compounded direct and indirect effects. Thus, to satisfy visitors, motivations of visit is another criterion to be considered besides physical environment. Compared to motivations, constraints have less effect on visitor satisfaction, and its influence is indirect. These results may fill the void in prior studies that are either dedicated to reveal the relationship between motivations and individual satisfaction [20,21,58] or verifying the relationship between service quality and individual satisfaction [66,112].

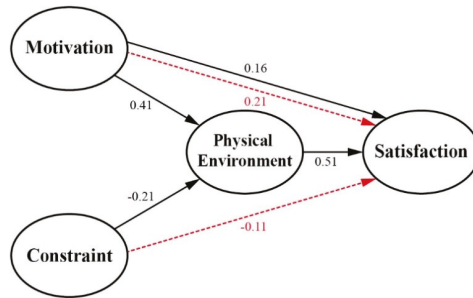


Figure 4. Interpretation of the structural model. Museum physical environment acts as an axial function in the model to transfer the impacts of motivation and constraint to visitor satisfaction. The indirect effect of motivation on satisfaction through physical environment is greater than its direct effect on satisfaction. Constraint has no direct effect on satisfaction.

4.4. Impacts of Motivation and Constraint on the Planning of Museum Physical Environment

To obtain the determinants of quality cognition towards a museum’s physical environment, five factors in visiting motivations and three in visiting constraints were included and their relationships with six planning and management factors of physical environment for museum were tested. Multiple regression analysis with stepwise approach was conducted to select the most influential set of indicators in each factor of physical environment (Table 6) to generate appropriate planning and managing strategies.

Table 6. Relationship between motivation and constraint towards visiting a museum and perception of museum physical environment.

Physical Environment (PhE)	Determinant	Beta	t-Value	Sig	VIF
PhE1 Architectural planning	Mo4 Family education	0.251	4.307	0.000 ***	1.289
	Con2 Unappealing soft content	-1.93	-3.747	0.000 ***	1.013
	Mo1 Self-development	0.163	2.780	0.000 ***	1.299
PhE2 Exhibition and marketing	Mo1 Self-development	0.174	2.892	0.004 **	1.299
	Con2 Unappealing soft content	-0.183	-3.456	0.001 **	1.013
	Mo4 Family education	0.170	2.836	0.005 **	1.289
PhE3 External environment and accessibility	Mo1 Self-development	0.161	2.606	0.010 *	1.301
	Mo4 Family education	0.140	2.277	0.023 *	1.290
	Con1 Poor museum image	-0.109	-2.001	0.046 *	1.017
PhE4 Entrance and ticketing	Mo4 Family education	0.191	3.154	0.002 **	1.289
	Con2 Unappealing soft content	-0.140	-2.614	0.009 **	1.013
	Mo1 Self-development	0.148	2.441	0.015 *	1.299
PhE5 Site planning	Mo4 Family education	0.294	5.524	0.000 ***	1.008
	Con1 Poor museum image	-0.165	-3.095	0.002 **	1.008
PhE6 Shop and café	Mo5 Attractiveness or obligation	0.165	2.655	0.008 **	1.329
	Con3 Unattractive service and cost	-0.152	-2.803	0.005 **	1.006
	Mo2 Occasion and social interaction	0.145	2.328	0.021 *	1.331

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In motivations, “self-development” (Mo1) is conceived to be a fundamental factor that motivates people to visit a museum [22,30]. In this study, self-development is related to four of the six factors of PhE in a museum, including “exhibition and marketing” (PhE2)”, “architectural planning” (PhE1), “External environment and accessibility” (PhE3), and “entrance and ticketing” (PhE4), at different strengths. “Family education” (Mo4) performed as the most profound motivation rather than self-development in relationship with the physical environment of a science museum. In the six factors of physical environment, family education affects five planning factors, even more than

self-development does. Consequently, museum planners or managers should pay extra attention to family education functions in planning or running a modern museum. Visitors motivated by family education were also found to cherish the educational and leisure value offered by the whole site of the museum, i.e., both interiors of the museum building and its outdoor areas.

In contrast with motivations, constraints hinder people from visiting a museum and should be cautiously avoided. The results show “Unappealing Soft Content” (Con2), which is connected with three of the physical environment factors, PhE1, PhE2, and PhE4, is the most influential constraint among the three towards perception of the physical environment. This is consistent with the previous study, which suggested that the quality of exhibition is vital to the decision of visiting a museum or not [101]. “Poor Museum Image” (Con1) is found to be a major constraint that keeps people from visiting, and its impact is concentrated in the external environment, i.e., PhE3 and PhE5. External environment is found to be especially sensitive to “poor image of the museum” (Con1). Planners and managers should make more efforts on the external environment when they intend to improve the museum image.

The study results yield some interesting patterns. The “architectural planning” (PhE1), “exhibition and marketing” (PhE2), and entrance and ticketing (PhE4) of a museum share the same determinants, namely “self-development” (Mo1), “unappealing soft content” (Con2), and “family education” (Mo4). The findings indicate self-development (Mo1), family education (Mo4), and soft content (Con2) are the basic determinants of museum physical environment. This pattern of visitor behavior is consistent with the main goal of a modern museum, which is to provide new knowledge, family education and an enjoyable experience to visitors. Other factors of physical environment show, in contrast, a heterogeneous pattern in their determinants. Site planning (PhE5) of a museum is affected by “family education” (Mo4) and hindered by “poor museum image” (Con1). In addition, the museum shop and café (PhE6), as ancillary services, reveals a distinct pattern compared to other physical environments. Visitors’ drive from “attractiveness or obligation” (Mo5), “occasion and social interaction” (Mo2), and halt from “unattractive service and cost” (Con3) are critical to the evaluation of shops and café. Although “leisure and companionship” (Mo3) is one of the main motivations to visit the museum, it affects none of the planning features of the museum. This motivational demand can be satisfied when others are also satisfied.

5. Implications and Limitation

5.1. Practical Implications

Compared to other tourist attractions, visitors to a museum are seeking a dynamic and unique experience. They come with different experiences and expectations, such as seeking new information or acquiring enjoyable, aesthetic and recreational experiences. Some motivation, such as family education, being with others, and cost, are listed as benefits of visiting a museum versus other tourist destinations [101]. The findings of this study show family education (Mo4) and self-development (Mo1) influence visitors’ perception towards physical environment of museum most profoundly. Hence, museum planners and managers should incorporate suitable physical environment and corresponding activities to serve the two motivations.

The findings about constraints also identify certain factors that may improve museum services when avoided. “Unappealing soft content” (Con2) and “poor images of the museum” (Con1) are shown to be constraints to visitors. In addition, “unattractive service and cost” (Con3), including monetary as well as psychological and physical, were perceived as constraints which could impede a visit. Hence, it is suggested that characteristics contrary to the constraints should be introduced to bring intriguing, novel, exciting and enjoyable experiences to visitors to repair the hindrance. A museum should increase the opportunities for visitors to physically interact through its exhibition content and format (e.g., using hands-on workshops or interactive technology). A well-designed physical environment both inside and around the museum buildings may reduce visitor dissatisfaction.

Enhancing the museum's general services and providing a flexible admission rate, such as discount for special events or rates varying according to age, visit timing, and frequency, could prove effective in encouraging attendance.

This study identifies six factors of physical environment that impact visitor satisfaction and deserve extra attention from museum managers and planners: Architectural Planning, Exhibition and Marketing, External Environment and Accessibility, Entrance and Ticketing, Site Planning, and Shop and Café. This examination of motivation and constraint as determinants of physical environment reveals distinct patterns, which equip planners and managers with tools to more precisely define the physical environment of a museum. The inherent planning issues of a museum, such as "architectural planning" (PhE1), "exhibition and marketing" (PhE2), as well as "entrance and ticketing" (PhE4) are related to motivations "self-development" (Mo1), "family education" (Mo4) and constraint "unappealing soft content" (Con2). While organizing these three factors of physical environment, planners and managers should pay extra attention to the functions of self-development (Mo1) and family education (Mo4) while specifically avoiding weak exhibition content (Con2).

Besides the interiors, the external environment of the museum is also found to have a significant impact on visitor satisfaction. Traditionally, planners and managers pay the most attention to the collection and visual elements of exhibitions and seldom note functions facilitating recreation and social interaction may also attract visitors. According to the study, the external environment of a museum should be designed specifically for family education (Mo4) and self-development (Mo1) while also emphasizing leisure functions. Enhanced external display areas in a natural environment can add to the museum experience. Facilitating walking and relaxing on the museum site and adding family-related facilities (e.g., family toilets and nursing room) will also be appreciated.

Additional services offered by a museum, such as catering, souvenir shops, barrier-free facilities, and special staff attention to seniors, as well as a comfortable environment all help create a warm and enjoyable experience for visitors. The study shows shop and café (PhE6), which have long been neglected, have a decisive influence on visitor satisfaction as well as meeting visitors' motivations including attractiveness and social interaction.

Research on tourism has confirmed visitor satisfaction and loyalty are two critical components of competitive sustainability in the tourism market [21]. Prior studies also confirm visitor satisfaction is vital to building customer loyalty in the service industry [1,3,10,11]. Those who visit the same museum over and over again are inclined to have high intention to revisit and are more likely to spread positive words to others. The study found the physical environment of a museum has an effective influence on visitor satisfaction. The results inform the museum planning or management as to which physical environment helps enhance visitor satisfaction.

5.2. Limitations

This study was conducted on a group of visitors to the National Science and Technology Museum, which is located in southern Taiwan. The results might be different compared to studies conducted across different locations and different types of museums (e.g., art museums). The proposed framework herein may be applied in future research to test different contexts.

The data collected were cross-sectional and non-experimental. Although SEM analysis provides a robust method for validating the causal relationships, the results should be reported with caution. Longitudinal observation and comparison were not possible due to the constraint of time and location. Future research will benefit from the collection of longitudinal and experimental data to measure the interrelationships between the research variables and provide more precise results in validation.

Though physical environment is verified as a mediator in this study, it explains already 35.3% variance of visitor satisfaction. Other factors also considered important for satisfaction, such as perceived value, corporate image, and quality of learning, were not included in the study. Future research may include and verify more constructs and extend or refine the relationships tested in this research.

6. Conclusions

In tourism research, researchers have treated motivations and constraints as critical components of satisfaction. However, few studies incorporate constraints as inhibitors of perceived quality of physical environment and satisfaction in making a destination choice. Besides, no conceptual model has been established that explicitly examines the relationship among individuals' motivations, constraints, perceived quality and satisfaction toward the physical environment. This study conceptualizes the four as a whole.

Five factors are identified in motivations toward visiting a museum: "self-development", "occasion and social interaction", "leisure and companionship", "family education", and "attractiveness or obligation", in which "self-development" (Mo1) is the strongest motive to visit a museum. Three constraints tend to hinder visiting: "poor images of the museum", "unappealing soft content", and "unattractive services and cost", in which "poor images of the museum" (Con1) is found to be a major constraint that keeps people from visiting. Six essential factors in physical environment are found to influence visitor satisfaction: "Architectural Planning", "Exhibition and Marketing", "External Environment and Accessibility", "Entrance and Ticketing", "Site Planning", and "Shop and Café".

The structural model of the study suggests that physical environment serves an axial function among motivations, constraints and satisfaction. Physical environment has a strong effect (0.51) on the satisfaction of museum visitors, and, through the mediating effect, physical environment further transfers the influences of motivations and constraints on satisfaction. Although motivations have a direct effect on satisfaction, its indirect effect (0.21) is stronger than the direct one (0.16). That is to say, physical environment mediates prevalingly between motivations and satisfaction. The impact of motivations on visitor satisfaction (total 0.37) is much more than that of constraints (−0.11). The whole model can explain 35.3% of the satisfaction of museum visitors.

In motivations, self-development (Mo1) is the strongest motive for people to visit a museum, but it does not act as the most profound factor to affect physical environment of museum. Notably, family education (Mo4) does, followed by self-development. For constraints, poor museum image (Con1), which is the strongest constraint against visiting a museum, largely influences the external environment. When combining the impacts of motivation and constraints in planning a museum, planners and managers should pay attention to providing the functions under self-development (Mo1), family education (Mo4), and contain better soft content (Con2), through which the basic demands of museum visitors can be satisfied. Leisure and companionship (Mo3) has no significant effect on the physical environment of a museum. Shop and Café (PhE6) as ancillary facilities are shown to be important to attract visitors, especially those who come for attractiveness (Mo5) and social interaction (Mo2). The study carries practical implications on museum planning or management and helps define physical environment toward achieving better visitor satisfaction.

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Appendix A. Visitors' Questionnaire

This survey investigates visitors' motivation, constraint, and satisfaction toward physical environment in the National Science and Technology Museum (NSTM). Please rate each of the following statement using a scale from 1 to 5 (1 being "strongly disagree", 5 being "strongly agree" unless otherwise noted) by placing a "√" in the corresponding box.

A. Motivation for visit

- A1. Improve my quality of life
- A2. Experience new things
- A3. Pursuit of interest
- A4. Engage in a worthy activity
- A5. Release stress and relax
- A6. For leisure
- A7. Attractive architecture
- A8. Improve parent-child relations
- A9. Work or school requirement
- A10. Learn something
- A11. Enhance social relations with accompanying person(s)
- A12. Special exhibition
- A13. Admission discount
- A14. Children's leisure and education
- A15. Make new friends
- A16. Just passing by and decided to come in
- A17. Kill time
- A18. Famous destination
- A19. Participate in a social activity
- A20. Participate in a parent-child activity
- A21. Invitation from the museum
- A22. Acquire new knowledge and information

B. Constraint from visit

- B1. Have bad impression about the museum
- B2. Transportation to/from museum inconvenient
- B3. Poor security around the museum
- B4. Unsafe environment
- B5. The museum environment is unclean
- B6. Insufficient leisure facilities on site
- B7. The museum site has too many barriers for moving around
- B8. The museum site is too hot and has no tree shade or shelter for rain
- B9. Must walk for a long line to enter the museum
- B10. Hard to get information on museum events
- B11. Opening hours not suitable for me
- B12. Admission too expensive
- B13. Poor restaurant service
- B14. Not enough stamina for such long visit
- B15. Exhibitions difficult to understand
- B16. Exhibitions unappealing
- B17. Not suitable for family
- B18. The museum's activities do not help me relax
- B19. Does not fulfill my social need
- B20. Crowded
- B21. Service quality unsatisfactory

C. Cognition of physical environment

- C1. Scenery on the museum site (include the surroundings)
- C2. Relaxing and comfortable landscape
- C3. Appealing environment
- C4. Convenient transportation access
- C5. Abundant parking
- C6. Easy to enter the museum
- C7. Bicycle parking provided
- C8. The museum site offers facilities for leisure and amusement
- C9. Beautiful and educational planting around the museum
- C10. Easy to find the entrance
- C11. Spacious and comfortable entrance
- C12. Simple ticket buying procedures
- C13. Reasonable admission price
- C14. Clear exhibition route and signage
- C15. Spacious and suitable environment for the exhibitions
- C16. Comfortable air-conditioning and ventilation in the exhibition space
- C17. Food service offered
- C18. Souvenir shop
- C19. Natural and artificial light utilized to create bright exhibition space
- C20. Visual display for the exhibition
- C21. Ample facilities to keep the place clean (e.g., trash bins)
- C22. Clear, accurate and sufficient interpretive boards
- C23. Clean and hygienic overall environment
- C24. Appropriate level of security
- C25. Secure indoor and outdoor spaces
- C26. Guided tour easy to understand
- C27. Ample information provided at the service desk
- C28. Personalized service for disabled persons
- C29. Information about museum easy to obtain
- C30. Appropriate museum opening hours
- C31. Interesting and vivid exhibition format
- C32. Educational exhibition content
- C33. Active promotion of activities and services
- C34. Adequate resting spaces along visiting route

Appendix B. Factor Analysis of Motivation, Constraint, and Physical Environment (PhE) of a Museum

A. Motivation:

Item	Mo1	Mo2	Mo3	Mo4	Mo5
	Self-Development	Occasion and Social Interaction	Leisure and Companionship	Family Education	Attractiveness or Obligation
A2. Experience new things	0.849				
A10. Learn something	0.784				
A4. Engage in a worthy activity	0.772				
A1. Improve my quality of life	0.756				
A3. Pursuit of interest	0.744				
A22. Acquire new knowledge and information	0.742				
A12. Special exhibition	0.660				
A16. Just passing by and decided to come in		0.781			
A17. Kill time		0.723			
A19. Participate in a social activity		0.691			
A21. Invitation from the museum		0.658			
A18. Famous destination		0.610			
A15. Make new friends		0.584			
A5. Release stress and relax			0.757		
A6. For leisure			0.753		
A11. Enhance social relations with accompanying person(s)			0.739		
A8. Improve parent-child relations			0.651		
A14. Children's leisure and education				0.788	
A20. Participate in a parent-child activity				0.782	
A13. Admission discount					0.612
A7. Attractive architecture					0.477
A9. Work or school requirement					0.437
Eigenvalue	4.552	3.184	2.709	1.688	1.389
Percent of variance explained	20.692	14.475	12.316	7.671	6.316
Percent of cumulative variance explained	20.692	35.167	47.483	55.154	61.470
KMO measure of sample adequacy			0.874		
Bartlett's test of sphericity			0.000		

B. Constraint:

Item	Con1			Con2		Con3	
	Poor Museum Image	Unappealing Soft Content	Unattractive Service and Cost				
B4. Unsafe facility	0.813						
B5. The museum environment is unclear	0.798						
B1. Have bad impression about the museum	0.776						
B3. Poor security around the museum	0.765						
B2. Transportation to/from museum inconvenient	0.711						
B7. The museum site has too many barriers for moving around	0.710						
B8. The museum site is too hot and has no tree shade or shelter for rain	0.665						
B9. Must walk for a long line to enter the museum	0.576						
B6. Insufficient leisure facilities on site	0.574						
B11. Opening hours not suitable for me	0.531						
B10. Hard to get information on museum events	0.492						
B18. The museum's activities do not help me relax		0.724					
B17. Not suitable for family		0.705					
B16. Exhibitions unappealing		0.705					
B15. Exhibitions difficult to understand		0.621					
B21. Service quality unsatisfactory		0.610					
B19. Does not fulfill my social need		0.594					
B20. Crowded		0.514					
B13. Poor restaurant service					0.742		
B14. Not enough stamina for such long visit					0.741		
B12. Admission too expensive					0.656		
Eigenvalue	6.018			4.220		3.081	
Percent of variance explained	28.656			20.096		14.673	
Percent of cumulative variance explained	28.656			48.753		63.426	
KMO measure of sample adequacy				0.953			
Bartlett's test of sphericity				0.000			

C. Physical Environment:

Item	PhE1	PhE2	PhE3	PhE4	PhE5	PhE6
	Architectural Planning	Exhibition and Marketing	External Environment and Accessibility	Entrance and Ticketing	Site Planning	Shop and Café
C21. Ample facilities to keep the place clean (e.g., trash bins)	0.673					
C20. Visual display for the exhibition	0.673					
C24. Appropriate level of security	0.672					
C16. Comfortable air-conditioning and ventilation in the exhibition space	0.632					
C25. Secure indoor and outdoor spaces	0.626					
C15. Spacious and suitable environment for the exhibitions	0.618					
C23. Clean and hygienic overall environment	0.594					
C19. Natural and artificial light utilized to create bright exhibition space	0.518					
C14. Clear exhibition route and signage	0.509					
C34. Adequate resting spaces along visiting route	0.484					
C29. Information about museum easy to obtain		0.722				
C28. Personalized service for disabled persons		0.700				
C30. Appropriate museum opening hours		0.685				
C27. Ample information provided at the service desk		0.676				
C26. Guided tour easy to understand		0.667				
C32. Educational exhibition content		0.660				
C33. Active promotion of activities and services		0.619				
C31. Interesting and vivid exhibition format		0.583				
C22. Clear, accurate and sufficient interpretive boards		0.518				
C2. Relaxing and comfortable landscape			0.807			
C1. Scenery on the museum site (include the surroundings)			0.765			
C3. Appealing environment			0.762			
C5. Abundant parking			0.669			
C4. Convenient transportation access			0.659			

C6. Easy to enter the museum						0.632			
C12. Simple ticket buying procedures							0.692		
C10. Easy to find the entrance							0.683		
C11. Spacious and comfortable entrance							0.679		
C13. Reasonable admission price							0.592		
C7. Bicycle parking provided								0.732	
C8. The museum site offers facilities for leisure and amusement								0.712	
C9. Beautiful and educational planting around the museum								0.654	
C17. Food service offered									0.792
C18. Souvenir shop									0.697
Eigenvalue		5.249	5.148	4.086	3.070	2.377	1.894		
Percent of variance explained		15.437	15.231	12.019	9.028	6.990	5.569		
Percent of cumulative variance explained		15.437	30.668	42.687	51.715	58.705	64.274		
KMO measure of sample adequacy						0.942			
Bartlett's test of sphericity						0.000			

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Article

Evaluation of All-for-One Tourism in Mountain Areas Using Multi-Source Data

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Abstract: All-for-one tourism is a new viewpoint of tourism development involving overall planning and cooperative mechanisms. Over the past few years, the researchers have put forward many conceptual models to guide the top-level design and specific practice of all-for-one tourism. However, these studies mainly focus on social, economic and cultural effect in mature tourism areas, lacking comprehensive analysis from geographical perspective and neglecting the underdeveloped regions. In this paper, we attempt to apply geographic information system technology to tourism evaluation, exploring the approach of all-for-one tourism development in mountain regions. Zunyi city is selected as the research region and evaluated on the abundance, quality and spatial pattern of tourism resources, climate comfort, natural disaster possibility, and convenience of infrastructure or social service. Multi-source datasets collected from websites, reanalysis data, remote sensing products and observation stations are used. Based on data analysis, some recommendations including enriching cultural tourism products through cultural creativity, ensuring regional coordinated development through spatial optimization, respecting the spatiotemporal characteristics of climate and the laws of nature, and strengthening construction of infrastructure, are discussed to promote the healthy development of all-for-one tourism.

Keywords: all-for-one tourism; spatial analysis; tourism evaluation; mountain areas

1. Introduction

Tourism, an international industry and the biggest provider of jobs, plays a vital role in promoting national or regional economic growth [1]. Since the period of reform and opening up, the tourism industry has been flourishing in China, and large numbers of attractions, scenic spots, restaurants and hotels have been developed for international or domestic tourists. According to the statistics provided by Ministry of Culture and Tourism of the People's Republic of China, the annual comprehensive contribution of the national tourism industry is about 9.13 trillion yuan, contributing to 11.04% of the total GDP, and tourism provides employment opportunities for 108.15 million people directly or indirectly, accounting for 10.28% of the total employment-population in 2017. However, the traditional scenic spot tourism has sunk into difficulty in driving the development of the regional economy over the past decades [2,3]. Thus, all-for-one tourism is put forward to adapt to the trend of new changes and promote the transformation and upgrading of tourism [4,5]. It is a new tourism mode aiming at developing a project in partnership with all stakeholders and involving in overall planning and cooperative development of all industries [6–12]. In recent years, all-for-one tourism has attracted the attention of governments, enterprises and social problem researchers, as it is regarded as an effective

and reliable approach to achieve rural revitalization and promote the coordinated and sustainable development of urban and rural areas [6].

Recently, various conceptual models have been presented to explain the connotation of all-for-one tourism. Li et al. [7] summed up all-for-one tourism as “four new ideas” (resources, products, industries and markets) and “eight constructive aspects” (all tourism elements, all professions, all processes, all levels, the entire space and time, the whole society, all participant departments and all latent tourists). They argued that all-for-one tourism should aim at providing tourists with sufficient product experiences by integrating various industries, cooperating different departments, uniting all participants in the region, and taking full use of tourism destinations. Li [8] pointed out that all-for-one tourism is a new regional coordinated development mode, where tourism is the dominant industry and promotes the development of the economy and society in the chosen region. The ultimate goal of all-for-one tourism is to achieve the scientific and reasonable integration of resources, industries and developments, as well as social co-construction and sharing through optimizing and upgrading the complex systematic structure within a specific region. Zhang et al. [9] emphasized the domain perspective of all-for-one tourism, including temporal-spatial domain, industry domain, element domain and management domain. Feng [5] unscrambled the necessity of all-for-one tourism development from the five characteristics of tourist destination summarized by Cooper et al. [10], and proposed to grasp development law, strengthen the problem-oriented principle and consider comprehensive impacts in the process of promoting transformation from scenic spots to all-for-one tourism. Wang [11] holds the view that all-for-one tourism is used to promote the innovation of ideas on tourism development and to push forward the reform of the administrative system of tourism in China. It advocates the idea of the sharing economy, developing a project in partnership with all stakeholders and protecting the freedom of individual participation in social life. These studies explored the connotation and development routes of all-for-one tourism, and describe the top-level design and developing blueprint of all-for-one tourism either in large natural regions or in small towns. However, these studies mainly focus on social, economic and cultural effects in mature tourism areas, while comprehensive evaluations from a geographic perspective are scarce.

For a long time, most attention has been paid to scenic spot tourism in the tourism community. For example, Potschin [12] analyzed how the quality of site-level environmental assessment could be improved by using the concept of natural capital. Yi and Hu [13] analyzed the relationship between tourist attractions and all-for-one tourism and put forward four development strategies of tourist attractions under the background of all-for-one tourism. Zhang [14] analyzed the internal factors affecting the development of the tourist attractions through a strengths weaknesses opportunities and threats (SWOT) analysis, qualitative analysis and quantitative analysis on China’s tourism resources. Their research datasets are from in-situ survey, site observation and field sampling, usually lacking objectivity, comprehensiveness or temporal-spatial continuity, thus it is difficult to meet the demand of overall planning and decision-making for all-for-one tourism. With the arrival of the era of big data, tourism research has brought forth amazing improvements. Zhu et al. [15] established a tourism resources attraction evaluation system using collected relevant information from the internet and analyzed the spatial pattern of tourism resources’ attraction in Beijing. Yang et al. [16] advocated that the large scale of big data could finely make up for the limitation of sample size issues faced by survey data users, providing a new way to understand tourist behavior. Similarly, Li et al. [17] argued that big data analytics could provide sufficient data without sampling bias, helping both academia and industries to better understand tourist behavior. Xiang et al. [18] claimed that big data analytics could develop new knowledge to reshape the understanding of hospitality industry and to support the corresponding decision-making. In all, big data allows a better understanding of tourism demand, tourist behavior, tourist satisfaction and other tourism issues.

In this paper a mountain tourism city, Zunyi, is chosen as the research region for a case study aiming to evaluate the suitability and explore the approach for all-for-one tourism development in mountain areas from a geographic perspective. The temporal-spatial analyses are based on multi-source datasets

collected from websites, reanalysis data, remote sensing products and observation stations. Many specific factors related to development of tourism industry are taken into consideration in the process of temporal-spatial analysis, including abundance, quality and spatial distribution of tourism resource, local topography, temperature, precipitation, relative humidity, surface wind speed, sunshine hour per day, land cover types, traffic facilities, hotels etc. On the basis of data analysis, some recommendations are proposed for development of all-for-one tourism, such as improving cultural tourism products through cultural creativity, ensuring regional coordinated development through spatial optimization, respecting the spatiotemporal characteristics of climate and the laws of nature, and strengthening the construction of infrastructure.

2. Data and Methods

2.1. Research Region

Zunyi City covers an area of 30.7 thousand km², locating in the northeast of Guizhou province, China (Figure 1). It possess abundant natural tourism resources, such as Chinese Jurassic Park, Liyuan Grassland Tourism Resort, Shuanghe Karst Cave National Geological Park, etc. At the same time, Zunyi is the national historical and cultural city in China, with world cultural heritage Hailongtun, world natural heritage Chishui Danxia. In addition, the subtropical monsoon climate is suitable for outdoor mountain tourism. It is cool and humid all year round, with abundant rainfall and sunshine, and there is no severe cold in winter and intense heat in summer [19,20]. In addition, Zunyi is a sacred place for red tourism in China [21], known as “the turning city, the capital of conference”. In 1935, the Communist Party of China held the famous Zunyi Conference, which became a turning point of the party’s life and death. In 2016, Zunyi was regarded as the national demonstration area of mountain all-for-one tourism by the Ministry of Culture and Tourism of the People’s Republic of China. Therefore, Zunyi is selected as the research area to explore the approach to developing all-for-one tourism in mountain areas from the geographical aspects in this paper.

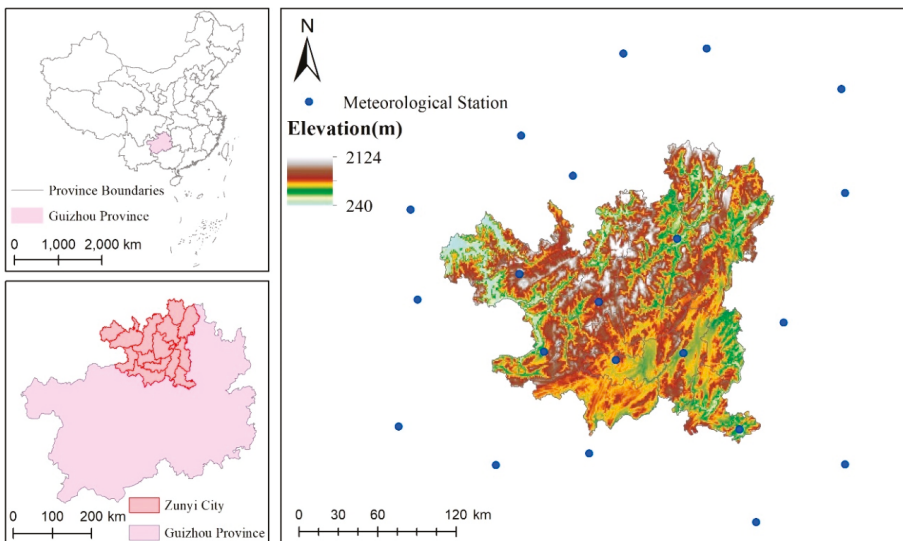


Figure 1. Location and DEM of Zunyi City. The meteorological stations are used for downscaling other raster datasets described in Section 2.3.

2.2. Basic Data

From a collection of relevant literature, discussions with experts, professional research reports and on-site surveys, we organized the overall architecture for evaluation of all-for-one tourism as shown in Figure 2. Three main aspects are taken into consideration, i.e., tourism resources, natural conditions and social service. Specifically, we attempt to estimate the abundance, quality and spatial characteristics of tourism resources. Climate comfort reflects a tourist's feelings under different meteorological conditions and is of great importance to the tourism industry, especially vacation tours [22]. It is influenced by many factors, such as air temperature, relative humidity, surface wind speed, and solar radiation etc., and there exists complex relationships among different factors. Thus, thermal environment model and cold environment model are used for comprehensive evaluation of natural conditions in the following sections. Meanwhile, natural disaster risk is another important factor and it might relate to altitude, slope, precipitation, surface vegetation, etc. Similarly, various elements are involved in social service, such as transportation, accommodation, delicacies, medical treatment, communication, customs etc. To conduct the temporal-spatial continuous evaluation, multi-source datasets are utilized. The specific datasets are listed as follows:

- Digital Elevation Model (DEM). DEM data used in this study is SRTM data (Shuttle Radar Topography Mission, NASA-NGA, USA). SRTM successfully generates the most complete high-resolution digital topographic database of the Earth, covering over 80% of the Earth's land surface between 60° north and 56° south latitude with data points posted every 1 arc-second (approximately 30 m). The elevation models are arranged into tiles, each covering one degree of latitude and one degree of longitude. The raw data can be obtained from the website: <http://srtm.csi.cgiar.org/SELECTION/inputCoord.asp>. Figure 1 shows the elevation of Zunyi, which ranges from 240 to 2124 m.
- NCEP/NCAR Global Reanalysis Products. It is a continually updated globally gridded data set that represents the state of the Earth's atmosphere, incorporating observations and numerical weather prediction (NWP) model output from 1948 to present. It is a joint product from the National Centers for Environmental Prediction (NCEP) and the National Center for Atmospheric Research (NCAR). Its monthly mean datasets are used in our study, including monthly mean air temperature, monthly mean of relative humidity and monthly surface wind speed. Their spatial resolution is about 2.5°. The data can be obtained at: ftp://ftp.cdc.noaa.gov/pub/Datasets/ncep_reanalysis.derived/surface/.
- Geospatial Data Cloud. It provides MODIS synthetic products in China. The datasets used in this paper includes China 1 KM land surface temperature (LST) monthly synthetic products (MODLT1M) and China 500 M normalized difference vegetation index (NDVI) monthly synthetic products (MODND1M). MODLT1M is the monthly average value of MODLT1T daily products while MODND1M is the maximum value of MODND1D daily products within a month. The data set is provided by International Scientific & Technical Data Mirror Site, Computer Network Information Center, Chinese Academy of Sciences. Registered users can freely obtain data from the website: <http://www.gscloud.cn>.
- SPOT-NDVI Data. The SPOT VGT-S NDVI data at 1 km spatial resolution can be obtained from <http://www.spot-vegetation.com/>. The VGT-S NDVI product is the synthesized NDVI for a 10-day period. The 10-day periods were defined as the 1st to 10th, the 11th to the 20th and the 21st to the end of each month. Thus, there are three NDVI images for each month. The monthly composite DNV images were derived from corresponding three 10-day NDVI products through calculating their maximum value. The VGT-S product has been pre-processed for geometric, radiometric and atmospheric corrections. Therefore, no further pre-processing of the SPOT VGT-S product is needed for practical application.
- TRMM 3B43 Data. The Tropical Rainfall Measuring Mission (TRMM) was launched in November 1997 as a joint project by NASA and the Japanese Space Agency (JAXA). The mission uses five

instruments: Precipitation Radar (PR), TRMM Microwave Imager (TMI), Visible Infrared Scanner (VIRS), Clouds & Earths Radiant Energy System (CERES) and Lightning Imaging Sensor (LSI). The TRMM Multi-satellite Precipitation Analysis (TMPA) was designed to combine all available precipitation datasets from different satellite sensors and monthly surface rain gauge data to provide estimation of precipitation at spatial resolution of 0.25°. One of TMPA products is the TRMM 3B43 monthly data, covering 50° N to 50° S for 1998–present. The latest Version 7 was available to public in May 2012 and can be obtained freely from <http://mirador.gsfc.nasa.gov>.

- In-situ Ground Meteorological Data. US National Climate Data Center is the world’s largest provider of meteorological and climatic data. Its land-based observations are collected from instruments sited at locations on every continent. They include temperature, dew point, relative humidity, precipitation, wind speed and direction, visibility, atmospheric pressure, and types of weather occurrences. Data on sub-hourly, hourly, daily, monthly, annual, and multiyear timescales are available. All used stations are displayed in Figure 1. The related datasets are free on website: <ftp://ftp.ncdc.noaa.gov/pub/data/g sod>.
- POI Data. A point of interest (POI) is a specific location that someone may find useful or interesting. In this study, related POIs include unitary tourism resource points, traffic facilities, hotels or homestays, hospitals or casualty stations, restaurants or farmsteads. These POIs are very important for assessment of tourism resources and social service, and for understanding tourist behavior and satisfaction. Many map service companies, such as Google (<https://cloud.google.com/maps-platform/>), Baidu (<http://lbsyun.baidu.com/>), Amap (<https://lbs.amap.com/>) etc., support location-based services, and POIs can be obtained from their map open platforms through keyword retrieval.

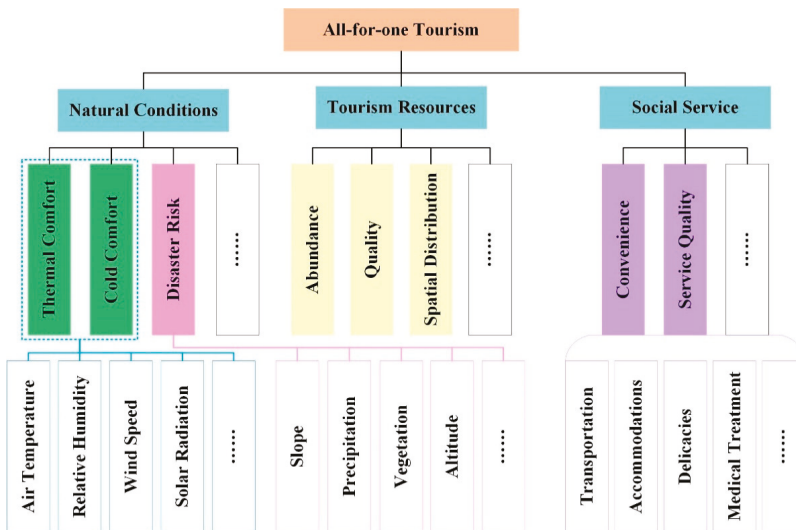


Figure 2. The overall architecture for assessment of all-for-one tourism development.

2.3. Downscaling Method

Over the past decades, development of satellite sensors has resulted in multiple sources of meteorological datasets, such as precipitation [23,24], land surface temperature [25,26], relative humidity [27,28] etc., that provide more reliable estimations over un-gauged areas compared with other interpolation methods. However, their spatial resolutions (i.e., 0.25–0.5°) are still too coarse for hydrological simulation and environmental modeling when applied to local basins and regions. Great

efforts have been made to advance the spatial downscaling algorithms of satellite-based meteorological datasets. For example, Immerzeel et al. [29] proposed an algorithm for downscaling TRMM-based annual precipitation datasets from 0.25° to 1 km by using the exponential function between the precipitation and NDVI. Jing et al. [30] implemented random forests (RF) and support vector machine (SVM) separately to downscale the yearly TRMM 3B43 V7 precipitation data from 25 km to 1 km over the Tibetan Plateau area based on precipitation-land surface characteristics.

In our study, the method in Immerzeel et al. [29] is used to downscale TRMM 3B43 data from 0.25° to 1 km, and the result is taken as inputs of the SVM-based method [30] to downscale monthly mean air temperature (AT), monthly mean of relative humidity (RH) and monthly surface wind speed (SWS) of NCEP/NCAR Global Reanalysis Products. Downscaled data will be further used for evaluation of natural conditions. DEM and NDVI are used as variables for air temperature downscaling. DEM, NDVI, land surface temperature and average precipitation are considered as independent variables for relative humidity and wind speed. Before downscaling, an additional process [31,32] is introduced to correct residuals of original reanalysis products using in-situ ground meteorological data. The used meteorological stations are shown in Figure 1. Figure 3 illustrates the flowchart for downscaling NCEP/NCAR products. More details are described in references [30–32].

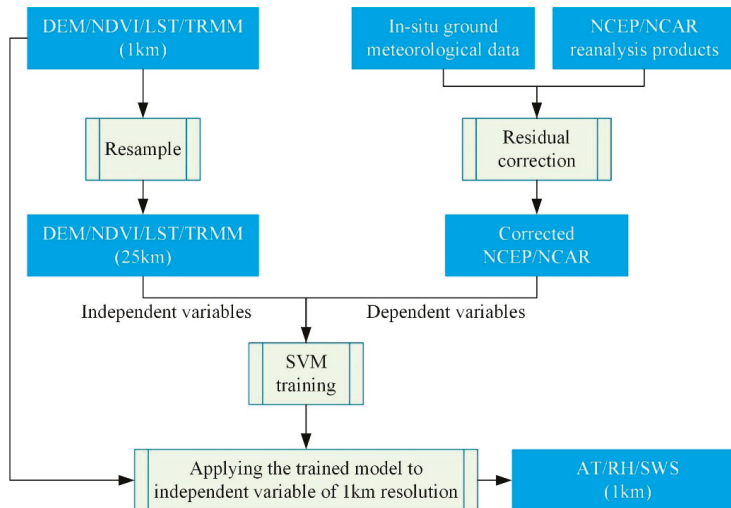


Figure 3. The flowchart of downscaling algorithm used in our study.

3. Results and Discussion

3.1. Tourism Resources

3.1.1. Abundance and Quality

In 2003, the Ministry of Culture and Tourism of the People's Republic of China promulgated *Classification, Investigation and Evaluation of Tourism Resources (GB/T 18972-2017)* [33] as the national standard. However, due to the rise of leisure vacation and the richness of tourism products, the traditional methods have been unable to meet the needs for classification of diverse new types of tourism resources, especially urban tourism resources. Based on the analysis of the concept, elements and characteristics of various tourism resources, and combined with other research [34,35], we make some improvements and the final classification system is shown as Table 1. Furthermore, we invited 15 experts with tourism and geography background to assess the quality of 100 randomly sampled tourism resource units. This was a subjective process in which each expert evaluated the

general quality of tourism resource units based upon their judgement and knowledge on tourism. The questionnaires (Appendix B in [33]) containing basic descriptions on natural characteristics, infrastructure and developing status, together with on-site pictures, are sent to the experts who are required to score to these units following the evaluation system in Table 2. The system limits the maximum score of each evaluation factor and the scoring range of their corresponding four-levels, representing “excellent”, “perfect”, “good” and “poor”, respectively. Another added value can be optionally given to the unit concerning its situation on environmental protection or safety, i.e., negative 5 points for seriously polluted status, negative 4 points for moderately polluted status, negative 3 points for slightly polluted status, while positive 3 points for status existing environmental protection measures.

Table 1. Types of tourism resources in Zunyi City. No. = number, P = proportion of total.

Main Category	Subcategory		Basic Type Types
	No.	P (%)	
Natural tourism resources	A. Geographical Landscape	142 17.66	AA. Comprehensive natural tourist destination (50)
			AB. Sedimentary and tectonic (3)
			AC. Geomorphic processes (79)
			AD. Natural Changes (10)
	B. Water Landscape	67 8.33	BA. Rivers (18)
		BB. Natural wetlands and marshes (30)	
		BC. Waterfalls (13)	
		BD. Springs (6)	
C. Ecological Landscape	39 4.85	CA. Woodland (17)	
		CC. Flowered areas (14)	
		CD. Wildlife habitat (8)	
D. Astronomical and Climate Landscape	11 1.37	DA. Light phenomena (4)	
		DB. Weather and climate phenomena (7)	
Subtotal	259 32.21	13	46/71
Manmade and cultural tourism resources	E. Heritage sites	148 18.41	EA. Prehistoric site (6)
			EB. Cultural and economic monument (142)
	F. Architecture and infrastructure	367 45.65	FA. Comprehensive cultural tourism destinations (97)
			FB. Dedicated activity sites (36)
			FC. Landscape architecture and attached buildings (160)
FD. Residential areas and communities (50)			
FE. Burial grounds (16)			
		FF. Transportation architecture (3)	
		FG. Hydraulic structures (5)	
G. Tourism products	17 2.11	GA. Local tourism products (17)	
H. Cultural Activities	13 1.62	HA. Memorials (2)	
		HB. Art (1)	
		HC. Folk customs (5)	
		HD. Modern festivals (5)	
Subtotal	545 67.79	14	50/84
Grand total	804 100	26/31 (83.87%)	96/155 (61.94%)

Table 2. Evaluation system of tourism resources.

Evaluation Item	Evaluation Factor	Score	Levels
Resource element value	Sightseeing & recreation value	30	30-22; 21-13; 12-6; 5-1
	Historical, cultural, science and Artistic value	25	25-20; 19-13; 12-6; 5-1
	Rare & singularity	15	15-13; 12-9; 8-4; 3-1
	Scale, abundance and probability	10	10-8; 7-5; 4-3; 2-1
	Integrity	5	5-4; 3; 2; 1
	Visibility & influence	10	10-8; 7-5; 4-3; 2-1
Resource influence	Appropriate tour period or using range	5	5-4; 3; 2; 1
Added value	Environmental protection & environmental safety	4/+	-5; -4; -3; 3

Statistical results show that there are 804 tourism resource units, covering 8 main categories, 26 out of 31 (83.87%) of subcategories and 95 out of 155 (61.94%) of basic types. It reveals that Zunyi boasts of varied landscapes and a rich combination of tourism resource types. The final average score of expert evaluation is 87.74 out of 100. According to these scores, tourism resources are divided into three grades according the standard [33] (Section 6.3.2.2). The units whose average score are larger than 90 are referred to as “excellent tourism resources”; if the average score is between 75 and 90, the unit is referred to as “perfect tourism resources”; while the others are treated as “general tourism resources”. In total, 33 out of 100 evaluated tourism resources are excellent, 28 are perfect and 39 are general. Although the personal perception of experts might affect the objectivity of the final results, this generally shows that tourism resources in Zunyi are of high quality. It is evident that abundant categories and excellent quality of tourism resources have laid a solid foundation for tourism development in Zunyi.

However, it is notable that although the main categories A-F account for more than half of the basic types, the proportion of tourism products (G) and cultural activities (H) are lower than 50% (only 2/7 and 6/16, respectively). In addition, the excellent units are mainly from natural tourism resources, while most manmade resources are of low-quality, especially category E and F. Therefore, it is particularly important to improve the quality of manmade tourism resources and enrich cultural tourism products through cultural creativity. Under the traditional tourism mode, tourists just visit the scenic spots and take pictures to record beautiful scenes or wonderful moments. It is difficult to satisfy tourists’ multi-level and diversified modern requirements for beautiful natural scenes, unique local cultural experiences, or age-old minority amorous feelings [36]. Thus, all-for-one tourism should pay attention to the creation of innovative cultural tourism products and the interaction between tourists and local culture. Firstly, traditional cultural resources can be directly utilized as tourism products. We can use traditional villages, cultural relics, museums, memorials, art galleries, world cultural heritage, intangible cultural heritage exhibition halls and other cultural sites to carry out cultural experience activities. Secondly, existing tourism products can be upgraded through cultural integration, focusing on in-depth excavation of historical culture, regional characteristic culture, national folk culture, traditional farming culture, and traditional handicraft culture. Thirdly, tourism can be combined with other industries. For example, in the field of agriculture, it is strongly advocated to develop sightseeing agriculture, leisure agriculture, creative agriculture such as pastoral landscape or balcony agronomy, and other agricultural patterns with tourism function such as customized agriculture, exhibition agriculture, family farming or family pasture.

3.1.2. Spatial Characteristics

Tourism resources are the foundation of the tourism industry. Different from fragmented scenic spots, all-for-one tourism treats a whole region as a tourist destination with complete functions to satisfy various tourists to achieve the integration of inside and outside scenic spots. The aim is to make everyone become a tourist and everywhere become tourism landscapes. The ideal state is that all tourism resources are evenly distributed spatially. Thus, it is vital to get knowledge of the spatial distribution of all tourism resources. Figure 4a shows the spatial distribution of natural and cultural tourism resources. Overall, different types are cross-distributed spatially, blending together. It is helpful to provide tourists with diverse sightseeing experiences, containing not only the relaxation and beauty of nature, but also solemnity or joyfulness from colorful historical or national culture.

However, the regional distribution of tourism resources is uneven, i.e., abundant in the central and western regions while few in the eastern region, as shown in Figure 4b. We further analyze the spatial density of tourism resources at pixel level. The kernel density analysis is widely used in the analysis of spatial characteristics and spatial patterns of geographical features [37], which is helpful to judge regional imbalance. It calculates the density of features in a neighborhood around those features.

Let (x_1, x_2, \dots, x_n) be a univariate independent and identically distributed sample drawn from some distribution with an unknown density f . Its kernel density at point x is:

$$\hat{f}_h(x) = \frac{1}{nh} \sum_{i=1}^n K\left(\frac{x-x_i}{h}\right), h > 0 \quad (1)$$

where K is the kernel, a non-negative function that integrates to one; h represents the bandwidth, which should be finely selected in practice. In our study, h is set to be the default value defined by the algorithm in ArcGIS [38]. Figure 4c shows the result of kernel density analysis. Multiple clustered centers are formed in space, especially in the northwestern and southwestern. The result is in agreement with results present in Figure 4b.

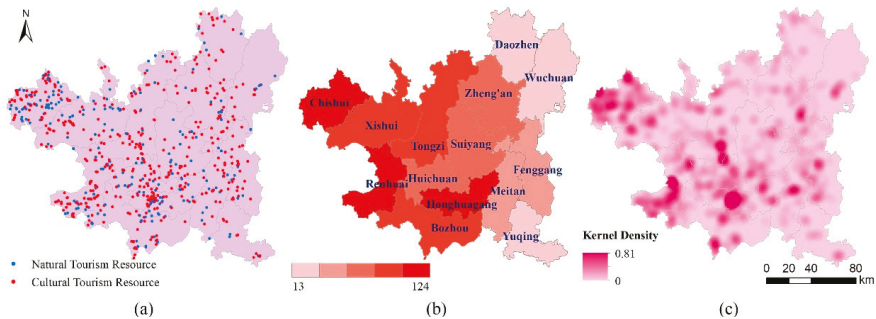


Figure 4. Spatial analysis of tourism resources. (a) Spatial distribution; (b) Regional statistics; (c) Kernel density.

The uneven spatial distribution of tourism resources remains a large obstacle to all-for-one tourism development. The government planning departments and tourism developers should pay more attention to discover and mine tourism landscapes in areas where tourism resources are scarce. Under the premise of ecological protection, natural landscapes must be developed appropriately. A more advisable approach is to integrate tourism industry with regional development. For example, in the process of rural revitalization, local residents can vigorously develop agricultural sightseeing, leisure tour, pastoral experience, or hold folk culture festivals, food tasting and feasting activities etc. Meanwhile, it must be emphasized that the development of all-for-one tourism must adjust to local conditions and highlight local characteristics. Every district should explore their unique approach through innovation to avoid having sluggish tourism attractions and products. The charm of all-for-one tourism lies in letting a hundred flowers bloom and being rich and colorful. For example, Danxia landform in Chishui and Xishui, red culture in Honghuagang and Bozhou, Gelao culture in Daozhen and Wuchuan, wine culture in Renhuai, and tea culture in Meitan can be the typical characteristics.

Currently, not all districts or towns in Zunyi meets the conditions to develop all-for-one tourism. Local tourism development committee should focus on constructing tourism infrastructure, creating top tourism products, widening the coverage of the tourism industry and improving the influence of tourism brands. To promote the development of all-for-one tourism, it is necessary to pay attention to the social and cultural impact of the tourism industry on tourism destinations and to take measures to promote the understanding of different cultures, protect the traditional cultural heritage, improve people's leisure level and life quality and eliminate the negative impact imposed by tourism development. It is also needed to attach great importance to the impact of tourism on the coordinated development of urban and rural areas. In the process of blending tourism into traditional rural and agricultural development, some problems and shortcomings, such as the guarantee of farmers' interests after excessive capitalization or semi-urbanization, should be taken seriously.

Another way to eliminate unbalanced development is to strengthen regional cooperation. The idea of tourism development must be transformed from the traditional scene sightseeing to all-for-one tourism mode. All-for-one tourism emphasizes regional comprehensive development concept, which requires breaking through the simplicity and closeness of scenic spots and extending the radiative effects of central tourism areas. It is necessary to strengthen cooperation with adjacent regions and jointly develop typical tourist routes or areas by linking various tourist attractions. Relying on the special geographical location, Zunyi can combine the tourism resources of Chongqing, Sichuan and Guizhou to design top-quality tourism routes, such as the red tourism line of the Long March, ecological tour zone of the Golden Triangle, and ethnic cultural tourism areas.

3.2. Natural Conditions

3.2.1. Climate Comfort

Climate is a salient resource for tourism and a dominant attribute of a tourist destination [22,39]. It has a major effect on tourism demand, satisfaction and decision-making [40] since tourists are sensitive to climate and climate change [41]. Thus, it is vital to assess the suitability of climate for tourism for the sake of decision-making by tourism participants. For instance, tourism planners could better evaluate a destination for tourism development and incorporate climate in infrastructure planning and programming; the insurance industry might design diverse weather insurance products for the tourism industry; tourists can choose a destination and take out insurance on likelihood of poor weather conditions occurring while on holidays. Researchers have made considerable efforts to devise climate indices owing to the multifaceted nature of weather and the complex ways the weather variables come together to give meaning to climate for tourism. In this study, temperature-humidity index (THI) [42] and wind effect index (WEI) [43] are chosen to assess the thermal comfort and cold comfort, separately.

Thermal comfort is the condition of mind that expresses human physiological satisfaction under the influence of temperature and humidity. THI is calculated by mean of dry bulb temperature and relative humidity and its expression is as followed [42]:

$$THI = t_d - 0.55(1 - 0.01RH)(t_d - 14.5) \quad (2)$$

where t_d represents the dry bulb temperature ($^{\circ}\text{C}$), RH is relative humidity (%). Herein, monthly mean air temperature and relative humidity of NCEP/NCAR reanalysis products preprocessed through method in Section 2.3 are used for calculation of THI. The values of 2013 locate in the range [9.2, 28.5] and are reclassified into five categories: Cold, cool, comfortable, warm and hot (Table 3) according to Kyle's study of the bioclimatic environment [44].

Table 3. Classification of temperature-humidity index (THI) and wind effect index (WEI).

THI ($^{\circ}\text{C}$)	Category	WEI
-1.7~13.0	Cold	-800~-600
13.0~14.0	Cool	-600~-300
15.0~20.0	Comfortable	-300~-200
20.0~26.5	Warm	-200~-50
26.5~29.9	Hot	-50~80

Cold comfort evaluates the suitability for outdoor activities by taking into consideration the effects of surface wind speed and solar radiation [45]. The expression of WEI is [43]:

$$WEI = -(10\sqrt{V} + 10.45 - V)(33 - T) + 8.55S \quad (3)$$

where V means surface wind speed (m/s), T is air temperature ($^{\circ}\text{C}$), and S is sunshine hour per day (h/d). Herein, monthly mean air temperature and surface wind speed of NCEP/NCAR reanalysis products preprocessed through method in Section 2.3 are used for calculation of WEI. Spatial continuous sunshine hours are obtained by means of interpolating in-situ measured data through Kriging method. The WEI values of 2013 vary in the range $[-742, 74]$ and are divided into five levels (Table 3) referring to Terjung's research [43].

Figure 5 shows the variation of THI of Zunyi in different seasons. It is clear that spring (April 2013) is the best, followed by autumn (October 2013). Although summer (July 2013) is overheating in local, most of the regions belong to warm. Winter (January 2014) tends to be cold and humid, with obvious boundary along the mountain from northeast to southwest. Such characteristics can mainly be attributed to the joint influence of topography and monsoon. In summer, Zunyi is affected by the southwest monsoon from the Indian Ocean, thus low-latitude areas in the southwest are obviously hotter than others, while high-altitude areas remain warm environments because of the vertical zonal effect. In winter, northwest monsoon dominates, but is greatly weakened by the Tibetan Plateau. Therefore, the northwest is much colder, but would not reach the freezing level. In contrast, the southeast is relatively warm as the northwest mountains further weaken the cold wind. In addition, Figure 5c shows the average THI from 2003 to 2013, indicating that the climate in Zunyi tends to be cool and comfortable. Figure 6 shows the spatial distribution of WEI in different seasons. We can draw a similar conclusion to THI. In contrast, a larger region tends to be comfortable and only high-altitude mountains above about 2000 m reach a cold level. Nevertheless, the average level of WEI from 2003 to 2013 belongs to the cool type in the entire space from the perspective of cold comfort. All in all, warm and comfortable environments create excellent conditions for mountain travel or outdoor hiking, attracting urban residents who are eager to return to nature and enjoy themselves.

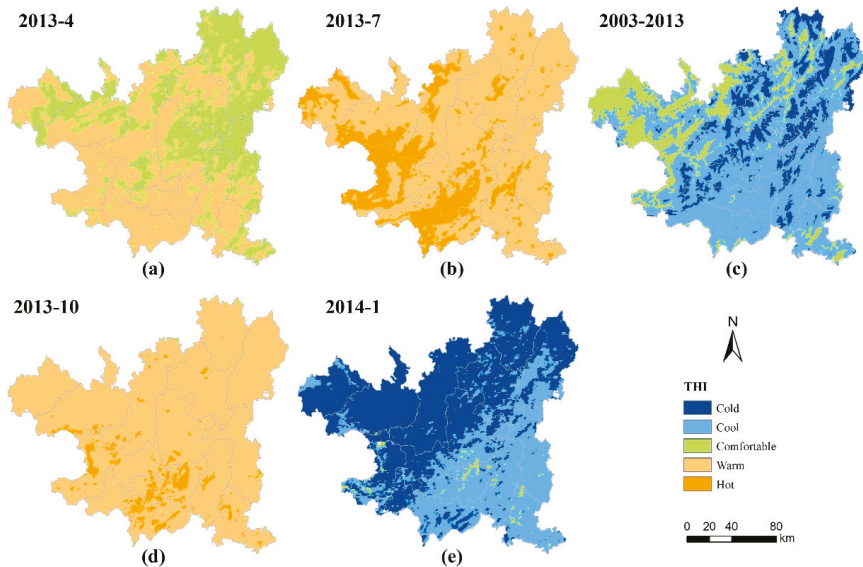


Figure 5. Variation of temperature-humidity index in different seasons. (a) Spring (April, 2013); (b) Summer (July, 2013); (c) Multi-year average (2003–2013); (d) Autumn (October, 2013); (e) Winter (January, 2014).

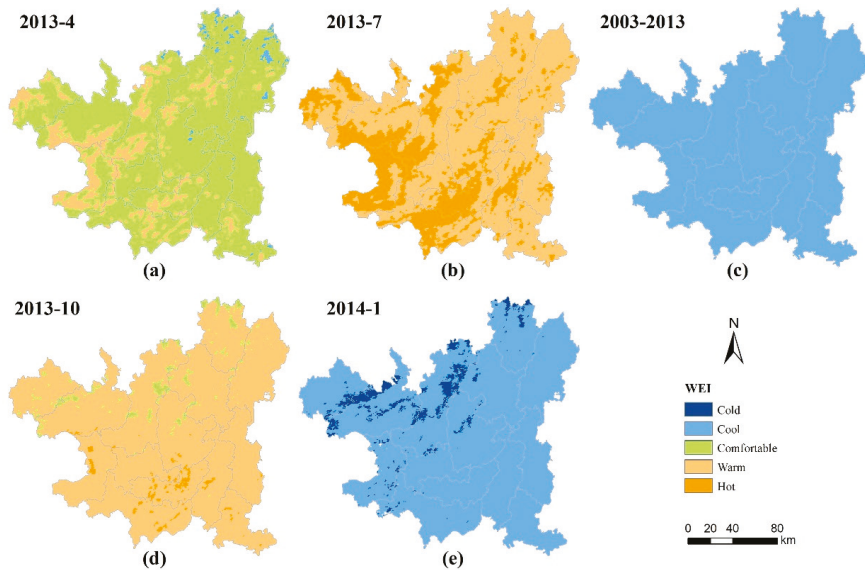


Figure 6. Variation of wind effect index in different seasons. (a) Spring (April, 2013); (b) Summer (July, 2013); (c) Multi-year average (2003–2013); (d) Autumn (October, 2013); (e) Winter (January, 2014).

The characteristics of the climate in Zunyi can be described as “four distinctive seasons, comfortable spring, warm autumn, no severe cold in winter, and no intense heat in summer”. It means that Zunyi is suitable for developing tourism all the year round, without an obvious peak season and off season, but with different scenery in different seasons. Moreover, due to the complex topography and relative high altitude, the climate shows the characteristics of diversity and vertical zonality. Generally, the whole region can be roughly divided into four vertical climate zones: Mid-subtropical climate in hilly and valley areas, northern subtropical climate in low-altitude mountain areas, northern temperate climate in middle mountain areas, and the middle temperate climate in mountain areas above 1500 m of sea level. Different vertical climatic zones in mountain areas affect the distribution of temperature, moisture, soil, animals and plants, resulting in various and distinctive geographical, hydrographic, ecological, or climatic landscapes [46]. Tourism planners should grasp the distribution of tourism resources and master the spatial and temporal characteristics of different landscapes so that they are able to develop high-quality tourist attractions and design reasonable tourist sightseeing routes adapting to seasonal changes and spatial variation to avoid singularity and repetition of tourism products. Zunyi is strongly recommended to focus on “summer leisure tourism” comparing to the torrid climate in most areas of China during summer. According to the statistics provided by China Tourism Academy, the number of domestic tourists for summer vacation (July and August) reached 1 billion in 2017 in China, accounting for 20% of the total number of tourists in the year. In addition, global warming will positively affect mountainous plateau areas or middle- and high-latitude zones, attracting more tourists for summer vacation thanks to their relatively cool environments [47,48].

3.2.2. Evaluation of Disaster Risk

Mountains provide a thoroughly challenging environment for special sports and leisure activities which attract aficionados such as mountaineers, paragliders, or downhill skiers [49]. Mountain tourism, especially mountain adventure tourism, differs from general mass tourism in lowland regions due to its higher requirements on the safety of the tourism area [50]. It is highly necessary to evaluate disaster risks for mountain tourism. Zunyi stands in the transition zones from the Yunnan-Guizhou Plateau to the Hunan hills and Sichuan basins with undulating topography and complex landforms.

The area of mountains in Zunyi reaches 65.08%, the hilly area accounts for 28.35%, while the flat dam and valley basin is only 6.57%. Meanwhile, rainfall is abundant in Zunyi. In summer, as southwest monsoon moves northward, the water vapor from the Bay of Bengal and the Indian Ocean increases dramatically, and Zunyi enters plum rains season with heavy and frequent rainfall. The statistics from Ministry of Natural Resources show that Zunyi is faced with a high possibility of geologic hazards, such as landslides, collapse, and mudslides.

This section intends to gain spatial continuous results of disaster possibility in Zunyi referring to the method in ref. [51]. Four inducing factors are taken into consideration: Slope (Figure 7a), precipitation (Figure 7b), NDVI (Figure 7c) and altitude (Figure 1). Note that the precipitation is a 10-year average value from 2005–2015 and NDVI is 1-year average value in 2015. Each factor is divided into five levels (1, 2, 3, 4, 5) through the Jenks natural breaks classification method [52,53] and the higher level means a greater possibility of disaster risk. Then the weighted sum of all factors is used for evaluation of comprehensive disaster possibility. Herein, the weights are 0.574, 0.291, 0.090, and 0.045 for slope, precipitation, NDVI and altitude, respectively. All weights are determined by analytic hierarchy process (AHP) [54], a subjective method that can reflect difference of relative importance among indexes properly. Figure 7d shows the final assessment results. Let the possibility 100% correspond to the maximum value 5, then the possibility 90%, 80%, 70%, 60% equals 4.5, 4, 3.5, and 3, respectively. In the northeast and the central mountain area, the disaster possibility is over 90% due to large slope and excessive precipitation. In contrast, the possibility in the southwest is relatively small with a large slope but little precipitation and dense vegetation. Other regions have a low possibility, mainly thanks to the flat terrain.

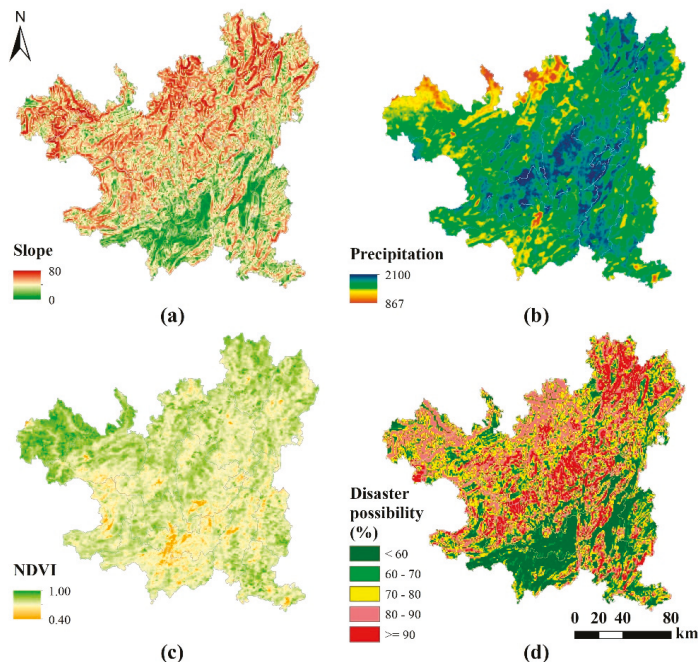


Figure 7. Evaluation of natural disaster risk. (a) Slope; (b) Precipitation; (c) NDVI; (d) Results of disaster risk. Note that the precipitation is 10-year average from 2005–2015 and NDVI is 1-year average in 2015.

During the development of tourism, humans should respect the laws of nature and avoid exploitation in areas with a fragile natural ecology and high risk of natural disasters. Promoting

all-for-one tourism does not mean developing tourism everywhere. Tourism development must be compatible with the carrying capacity of resources and the environment. If damage from environmental pollution caused by development of the tourism industry exceeds an acceptable ecological security threshold, it will threaten ecological service functions and the sustainable development of tourism areas [55]. Unfortunately, the diverse stakeholders often violate the objective laws for their immediate interests and contrasting goals during the process of tourism development. Innovative approaches are required to aid in the conflict resolution process. Research has shown that as the level of agreement between groups of stakeholders increases, so does the likelihood of collaboration and compromise [56]. At the local level, communities represented by local government officials are usually responsible for coordinating the relationships between public authorities, business owners, and other social stakeholders. In addition, collaboration with the academic community needs to be enhanced. Professional planning measures are needed to realize rational layout and optimal allocation of resources, facilities, elements, functions and industries in an all-round way so as to better relieve and reduce the pressure on core resources and ecological environments. From the perspective of humanistic concern, tourist-warning signs should be set up in particular locations to remind tourists to stay away from danger. At the same time, administrative departments should establish early-warning system to monitor the main inducing factors and assess the risk of natural disaster in real time, thus proper preventions can be arranged in advance to minimize the economic loss and casualties.

3.3. Social Service

Satisfying tourists is the final goal of tourism service as well as an important guarantee for the long-term development of tourism industry. Tourist satisfaction is a comprehensive judgment and psychological evaluation on tourism landscapes, natural and cultural environments, infrastructure, and social services etc. Through map open platforms, we have accumulated a large number of POIs relating to tourism, which are classified into four categories: Traffic facilities, hotels or homestays, hospitals or casualty stations, restaurants or farmsteads. Note that traffic facilities include passenger stations, railway stations, airports, entrance to expressway or main road. In this section, we measure the convenience of every spatial point by calculating its nearest Euclidean distance to POIs, considering the difficulty of constructing topological relations of spatial paths. The weighted average distance of all types of POI is treated as the final convenience of social services. All weights are determined through AHP and the values are 0.537, 0.232, 0.139, and 0.092 for traffic, hotel, hospital and restaurant, respectively.

Figure 8a shows the direct results of weighted average distance, which is divided into five levels (1, 2, 3, 4, 5) through the Jenks natural breaks classification method as shown in Figure 8b. Furthermore, the grading results are overlapped with results of land cover classification, containing urban construction areas and rural residential lands interpreted from Landsat 8 OLI images in 2015. Figure 8b shows that almost all urban areas belong to level 5, areas with the highest convenience of social services, while most rural areas are located in level 4 and 3, and extremely few people live in level 2 and 1. It indicates that the urban areas occupy most of the social resources while infrastructure in rural areas is relatively backwards.

Although this article only analyzes the limited resources, the problems reflected are universal. With the development of urban and rural economy and the improvement of farmers' living standards, the demand for public services is increasing. Currently, one of the most urgent need for the rural revitalization is the rural infrastructure construction related to the improvement of people's livelihood, including road construction, water supply, medical treatment, garbage collection, toilet improvement, street lighting, public transport etc. All-for-one tourism is an important approach to realize the strategy of rural revitalization. In order to revitalize the tourism industry, many initiatives need to be implemented simultaneously. On the one hand, great importance should be attached to rural infrastructure construction from the policy and investment. On the other hand, improvements are

highly required to perfect the legislation on the tracking, management, implementation, maintenance, investigation and evaluation of relevant rural funds and policies.

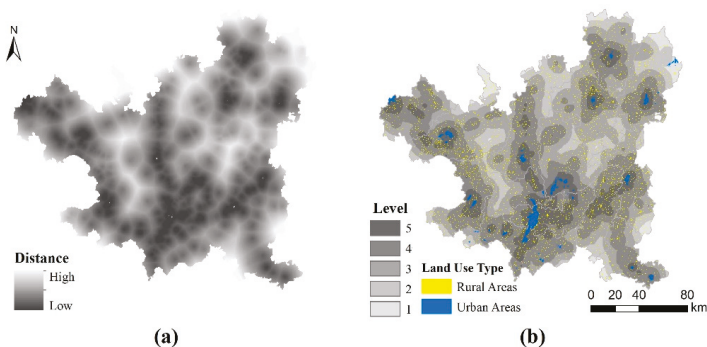


Figure 8. Evaluation of social service. (a) The results of weighted average distance; (b) The grading results of social convenience. Land cover types are interpreted from Landsat 8 OLI images in 2015.

The development of all-for-one tourism requires more convenient and high-quality transportation services. Transportation serves as a bridge to link tourists and tourism destination, especially with the rise of self-driving travelling the relationship between traffic and tourism becomes much closer. The local government must increase direct investment and guide enterprises' own investment to build up a complete tourism traffic network and improve public transport service facilities. Standardized traffic signs with distinctive visual effects and effective guidance should be set up on highways and main tour routes. Meanwhile, it is necessary to integrate traffic services with related tourism elements, such as tourism consultation, theme accommodation, the flavor of food and beverages, special shopping, and leisure and entertainment options. Parking lots, new energy vehicle charging piles, tourist toilets and other facilities are required to meet the traveling needs of tourists. It is also suggested to build an official tourism website, mobile phone app and public micro-signal in A-level scenic spots to provide tourists with a tour guide, route navigation and shopping services.

4. Summary

In this paper, we systematically analyzed the present situation of all-for-one tourism in Zunyi concerning tourism resources, natural conditions and social conditions from the geographical perspective. Some conclusions are drawn: (1) Zunyi possesses various high-quality landscapes and a rich combination of tourism resource types, but is relatively weak in providing cultural tourism products; (2) Different types of tourism resources are highly integrated, but the spatial distribution is uneven, i.e., abundant in the central and western while few in the eastern; (3) The climate is suitable for mountain tourism all year round and its variation in temporal and spatial domain breeds abundant natural tourism resources; (4) Some areas with large slope and excessive precipitation are in face of high risk of natural disaster; (5) The imbalance between urban areas and rural areas is a main obstacle to the development of all-for-one tourism. In fact, other regions in China are facing similar problems during the development of all-for-one tourism [15,20,34–37,40].

Based on the case study, some general recommendations are present to address the current problems for the healthy development of all-for-one tourism: (1) improving the quality of manmade tourism resources and enriching cultural tourism products through cultural creativity; (2) integrating tourism industry with regional development, strengthening regional cooperation with nearby tourism areas and focusing on construction of tourism infrastructure in backward areas; (3) designing tourist sightseeing routes adapting to the spatial and temporal characteristics of different landscapes; (4) respecting the laws of nature and avoiding exploitation in areas with fragile natural ecology

and high risk of natural disasters; (5) strengthening construction of infrastructure and building up a complete tourism traffic network. All-for-one tourism is a new viewpoint of tourism development involving in overall planning and cooperative mechanism. In practice, every participant should be aware of the complexity and comprehensiveness of each problem. For example, we should not only focus on the quantity of tourism resources, but also pay attention to their quality and spatial layout. Apart from emphasizing the investment and construction of infrastructure, great importance must be attached to the spatial balance of social services and coordinated development between urban and rural areas.

All-for-one tourism is a highly comprehensive and recapitulative concept. Our study concentrates on revealing objective phenomena or situations in temporal and spatial domain. In order to reflect its development connotation in a more comprehensive way, it is better to evaluate and analyze all-for-one tourism from many other perspectives and dimensions, such as personnel training. Restricted by the cultural level, many tour guides cannot provide professional interpretation service to meet the differentiated expectations of tourists. It is necessary to strengthen the ability and quality of tourism practitioners and promote the transformation of tour guides from explanatory and reception services to cultural and professional services. Tourism schools must shoulder the responsibility of cultivating compound, modernized, and international tourism talents by means of strengthening effective links with tourism industry, enterprises and society, promoting cooperation with governments, enterprises, other schools and international organizations.

The limitation of our study is based on the fact that all findings rely on the specific case and thus cannot be generalized. These experiences should not be copied, but altered adaptively when applying to other application scenarios. In addition, more datasets should be integrated into the evaluation process, such as statistical data on the total volume, the market characteristics, the consumption situation and the market trends in the source of tourists. At present, tourism management departments are actively promoting the accumulation of tourism statistics, the construction of tourism big data, and the application of data science and technology in tourism industry. With the continuous improvement of tourism-related methods and technology, it is reasonable to believe that the evaluation of all-for-one tourism will be more systematic and complete.

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Article

Regional Tourism Clustering Based on the Three Ps of the Sustainability Services Marketing Matrix: An Example of Central and Eastern European Countries

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Abstract: The impact of tourism on quality of life standards in regions is significant in terms of people, planet, and profit. This paper examines the subnational NUTS 2 level regions, (in line with Eurostat) by applying several interlinked and connected indicators. Adopting the three Ps (people, planet, profit) of the Sustainability Services Marketing Mix, this article discusses the fusion of 54 regions of Central and Eastern Europe (Czech Republic, Slovakia, Hungary, Poland, Estonia, Lithuania, Latvia, Slovenia, Romania, and Bulgaria) into clusters according to the selected accommodation tourism indicators used by the European Statistical Agency (Eurostat) to evaluate tourism. Since many variables of the Prague region significantly exceed the values of the remaining regions, this region has been considered as an individual cluster, excluded from the cluster analysis. The cluster analysis resulted in the definition of six clusters consisting of regions with similar indicators' statistics characteristics. The presented approach changes the traditional approach to clusters in tourism and provokes thinking about new criteria of clustering and solutions in the field of tourism, especially when considering future cooperation, competitiveness, and sustainable development.

Keywords: sustainability services marketing matrix; cluster analysis; tourism indicators; regional disparity

1. Introduction

The demand for quality services and competitive business environments have led to the definition of several quality measurement methods. As summarized by Charles and Kumar [1], abundant research has been carried out to measure the quality of services in various sectors (e.g., banking services, medical services, travel and tourism, mobile communications, etc.). Most of the people, who travel, like to have information concerning a journey, accommodation, food, and even beyond these few necessities on the supply side. On the other hand, the people who prepare the journey, accommodation, food, and other services also need to acquire information on the demand side of market (preferences). The asymmetry of information may cause market failures. The production

function in the tourism industry is the starting point for this quite complex analysis, for instance, the production function described by Smith [2].

The general statistics of demand and supply (e.g., overnights or bed places) are mostly known in a country that tries to open-up for tourists. Such statistics are presented in this paper with the help of the cluster analysis. This cluster analysis and its results should serve further research in the tourism industry. The main aim of the paper is to present an “alternative” approach to study and research in the field of clusters in tourism that are based on Porter’s cluster theory [3,4].

The tourism sector combines a diversity of subsectors (transportation, food, culture entertainment, etc.). Also, in terms of tourism outputs, there may be a diversity of positive and negative effects. A prevalence of positive effects is desired in peoples’ experiences and companies’ profits. A counterbalance of these positives are negatives on the side of the planet (e.g., environmental load). Three “P”: Planet, People, and Profit are taken into consideration as a triple line approach [5]. In Reference [5], authors discuss the Sustainability Services Marketing Matrix (SSMM) in detail. Based on this approach, the cluster analysis in the present study focuses on the following conjunctions: (1) Place vs. people (urban and rural tourism in variables used later), (2) product vs. people (nights—in variables used later—suggest the product of city breaks [6,7], weekend stays only, etc.), (3) participants vs. people (bed places in variables used later for cluster analysis that can lack a bit of detail [8,9]). The triple line approach (planet, people, and profit) is complex and rich and may lead to a variety of assessments. The understanding of tourism is of a regional character for most of the communities, this is why clusters formed of regions can be useful here. Furthermore, the proximity of Visegrad countries can use the advantage of a common marketing strategy and thus an SSMM. Such a manifold scale of research is not feasible for this paper. In this case, the hindrance is represented by the variables that need to be gathered and linked to the right position.

Xiao and Smith [10] have pointed out that one of the major limitations of research in tourism is caused by the fact that the research is, in most cases, concerned with a single case, location, nationality, etc. (e.g., [11,12]). The authors in Reference [10] prove this fact to be acceptable, however, they emphasize that a methodological implementation is beneficial to overall tourism research. One such complex methodology is comprehended by the Swedish Destination Management Information System (DMIS) [13], which is complex and relatively easy to implement thanks to information and communication technologies. Another example is the Destination Business Information System (DBIS) currently developed in Slovakia [14–16]. This shows that Online Analytical Processing (OLAP) presents results of data mining that can include these tools: Artificial neural networks, decision analysis, rule induction, K-nearest neighbor techniques, clustering, as well as association rules [17].

2. Literature Review and Theoretical Considerations

Clusters in tourism have become a relatively large subject of interest in the last two decades. As summarized by Ferreira and Estevao [18], the interest in cluster issues lies in the impact of the performance, regional development, and countries competitiveness [19]. In various regions or countries, clusters have played a significant role in tourism [20]. Moreover, Jackson and Murphy [20] argue that, applying the cluster theory in the tourism sector, the satisfaction of tourists does not only depend on the primary attraction of the place, but also on the quality and efficiency of related businesses (hotels, restaurants, etc.) [18].

Various authors have introduced a definition of the tourism cluster, specific approach of use, or an application of clustering in tourism. A classical approach to the clusters in tourism is primarily based on Porter’s cluster theory (Figure 1) [3,4]. According to Porter [4], clusters are “geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (universities, standards agencies, and trade associations) in particular fields that compete but also cooperate”.

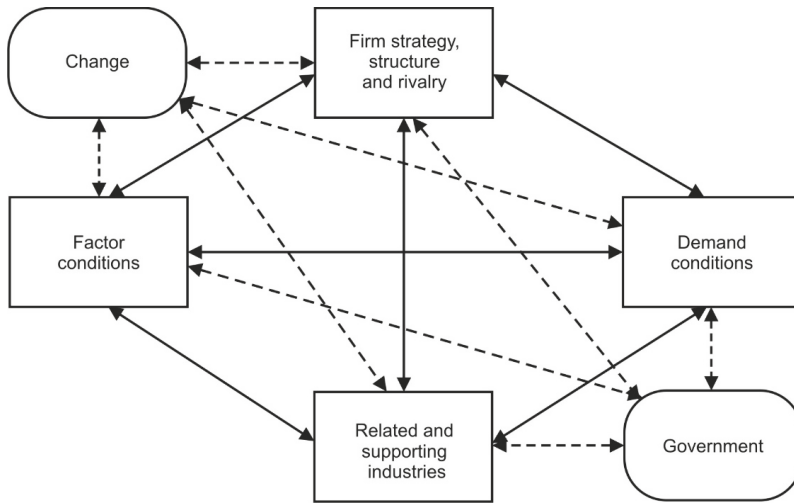


Figure 1. Porter's Diamond Model [3].

Jackson and Murphy [20] note that clusters have become significant forces in tourism development, particularly in cases where they have transformed or developed into active organizations or destination associations. As summarized by da Cunha and da Cunha [21], Monfort's tourism cluster concept [22] is based on characteristics and components. They define a cluster as "a complex group of different elements, including services carried out by tourism companies or business (lodging, restoration, travel agencies, aquatic and theme parks, etc.); richness provided by tourist holiday experiences; multidimensional gathering of interrelated companies and industries; communication and transportation infrastructures; complementary activities (commercial allotment, holiday traditions, etc.); supporting services (formation and information, etc.); and natural resources and institutional policies". Beni's approach [23] to the tourism cluster focuses on the cohesion between agents and cooperation, based on the following definition: "Tourism cluster is a group of highlighted tourism attractions within a limited geographic space provided with high quality equipment and services, social and political cohesion, linkage between productive chain and associative culture, and excellent management in company nets that bring about comparative and competitive strategic advantages." The European Commission [24] defines a cluster as "a progressive form of business network, which has strong business objectives focusing on improving sales and profits. It makes the exchange of information and technology possible, encouraging different ways of co-ordination and collaboration within them". According to Kachniewska [25], there is no one recommended cluster model that would be appropriate in every condition. She assumes that the formulation of attributes of the tourism cluster should refer to different cluster classifications, based on the following criteria:

- the economy sector,
- modernity of the industry,
- foundation motives,
- governance system,
- form of cooperational type,
- level of awareness,
- scope,
- life cycle stage,
- the structure of the cluster [25,26].

According to the characteristics of the tourism cluster, local development programs should consider it as a local strategy for combating regional disparities and social inequality [27].

Based on the regional competitiveness model of cluster introduced by Ferreira and Esteveao [18], if the interconnection links between tourism product and tourist destination are effective, the tourism cluster will work in a productive way [28].

Despite the general acceptance, popularity, and application of the Porter's Diamond Model, Davies and Ellis [29] criticize the model because "sustained prosperity may be achieved without a nation becoming 'innovation-driven', strong 'diamonds' are not in place in the home bases of many internationally successful industries and inward foreign direct investment does not indicate a lack of 'competitiveness' or low national productivity" [29].

In general, Porter's cluster theory [3,4] is an approach that focuses on companies and results in finding competitive strengths. However, on a large scale, there are also other tools that can be used, e.g., input-output analyses, when studying the industry that comprises small and medium-sized enterprises (SMEs) and transnational corporations [30–32]. Another option can be data envelopment analysis for a truly microeconomic approach of only one part of a service, e.g., accommodation [33]. This is the way for profit seeking companies that watch the signposts for efficiency. However, efficiency in tourism is sustainable if the product itself is sustainable [34].

Similar to companies, consumers are also willing to achieve a reasonable ratio that compares price and performance. In this regard, consumers in tourism may have various motivations for his/her willingness to undertake tourism experience. The reasons may range from discovering history and culture, through adventure, adrenaline, fun and health seeking, to the environmentally based cases [35,36].

From a historical perspective, religious and/or health pilgrimage reasons (e.g., to Santiago de Compostela) can be considered the forerunners of European tourism. Already in the Middle Ages, the religious or health travelers were supported by simple accommodations and food facilities established on the way towards the destination. The development of facilities was notable especially in places where the healing effects of spring water, mud, ocean, or mountain air proved themselves as a cure. As "side effects", health travelers often noticed the landscapes and/or cultural events during their visits to different regions. This turned the attention of locals (one of the first stakeholders) towards enriching and diversifying facilities and services (e.g., for pleasure, gambling, etc.). In Europe, Thomas Cook introduced the first organized tourist trips among first tourists' products in 1842 [36]. Development in the tourism sector was driven by the increasing number of outbound travelers that led to the global tourism market (even Antarctica is on the map of tourism). Therefore, creating or defining geographical regions at different scales (e.g., for tourism development purposes, or competitiveness increase) represented by clusters or networks is reasonable.

Recent tourism development strategies are closely connected to various sustainability issues [37–41]. On the customer side, one of the most crucial points is tourist satisfaction. In this regard, the most complex approach has been introduced by Pomeroy, Noble and Johnson [5], recently updated by Pomeroy and Johnson [41]—the Sustainability Services Marketing Matrix. In this matrix, eight services marketing mix elements cross-reference the three pillars of the triple line to provide a sustainability-relevant services marketing framework for operationalizing sustainability (Table 1) [41].

The SSMM approach may significantly help solve various sustainability issues via decision-making captured within the elements of the services marketing mix [41]. The cluster product may well encompass the triple line and SSMM. A cluster product that helps to conserve nature and history needs good management based on well-timed information [42].

Understanding first two points regarding (1) companies and their profit, and (2) consumers and their utility, there is a third to the conundrum, and that is the planet. While profit and utility increase, the planet often suffers, e.g., residents living in cities crowded by tourists [43,44]. The number of visitors has been included in the cluster analysis presented in this paper.

Table 1. The Sustainability Services Marketing Matrix [41].

	Product	Price	Promotion	Place	Participants	Process	Physical Evidence	Partnerships
Planet	Service product impact on Planet	Pricing impact on Planet	Promotion impact on Planet	Place impact on Planet	Participants impact on Planet	Process impact on Planet	PE impact on Planet	Partnership impact on Planet
People	Service product impact on people	Pricing impact on People	Promotion impact on People	Place impact on People	Participants impact on People	Process impact on People	PE impact on People	Partnership impact on People
Profit	Service product impact on long-term Profitability	Pricing impact on long-term Profitability	Promotion impact on long-term Profitability	Place impact on long-term Profitability	Participants impact on long-term Profitability	Process impact on long-term Profitability	PE impact on long-term Profitability	Partnership impact on long-term Profitability

Clustering can point out the existing trend of “tourist accumulation” that can be then influenced by motivating tour operators to spread the number of tourists over the near-by areas of the cluster in preparation of a “one cluster product”. In such a cluster product, the aims of sustainability can be managed better. For management, data, both qualitative and quantitative, are of crucial importance (Figure 2). In the cluster analysis presented in this paper, only quantitative data were used. This could be well accompanied with a further, in-depth literature review [45] of the results of a country classification according to their level of tourism growth during the period 2007–2016 [34]. This investigation showed that Visegrad countries were among the LTG cluster (low tourism growth) based on factor analysis. Such results seem to coincide with the better management or regulation of the tourism flows [46].

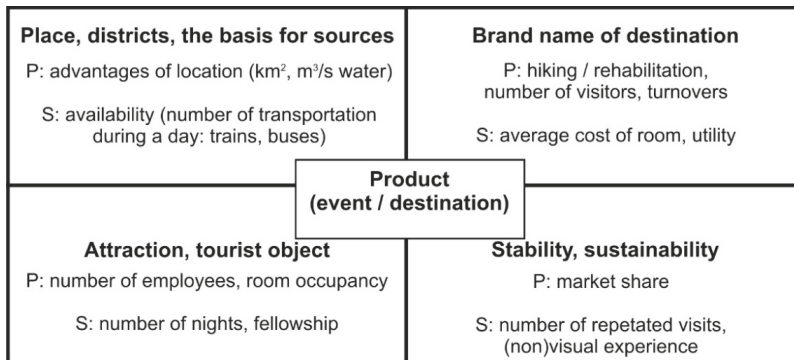


Figure 2. Scheme of general concept towards the “one cluster product” and its criteria for evaluations, for instance in cluster analysis (P: provider of services, S: consumer view).

3. Empirical Aims and Methodology: Disparities Among Regions of Middle and Eastern Europe in the Field of Tourism

There are many different approaches that are applied in the definition of regional disparity. However, in any case, disparity is considered a multi-dimensional problem [47].

In the frame of European Union cohesion, according to the horizontal classification, we distinguish three basic types of disparities: Economic, social and territorial. As territorial indicators, we consider the indicators from the area of environment, transport, health care, science, information society, and tourism.

Some adequate indicators of tourism of regional disparities can be identified in the Eurostat publication Methodological Manual for Tourism Statistics [48]. According to the characteristics of the

tourism cluster, local development programs consider it to be a local strategy for combating regional disparities and social inequality. Porter [3] emphasizes that tourism does not depend only on the appeal of the main attraction (beaches or historical sites), but also on the comfort and service of hotels, restaurants, souvenir shops, airports, other modes of transport and so on.

In this paper, 54 NUTS 2 regions have been analyzed in order to find the regional disparities from the perspective of selected accommodation tourism indicators. The following countries were included in the study: Czech Republic (8 regions), Slovak Republic (4 regions), Hungary (7 regions), Poland (16 regions), Estonia (1 region), Lithuania (1 region), Latvia (1 region), Slovenia (2 regions), Romania (8 regions) and Bulgaria (6 regions).

3.1. Data: Indicators of Regional Tourism (by Eurostat)

The input data for this analysis are indicators obtained from the Eurostat database. This database provides sixteen main categories of data on regional statistics by NUTS classification, but we consider only regional tourism statistics. This category is characterized by a more detailed set of indicators in a given time series. For the purpose of the study, data from the year 2014 were chosen.

The method, how the indicators of tourism statistics are constructed, can be found in the Eurostat publication [48] mentioned above. The main focus of this manual is on explanatory notes on the variables of tourism statistics and their breakdowns.

Considering the position of accommodation statistics within the system of tourism statistics, accommodation (rented or non-rented) is a core tourism subsector even if it is relevant for one part of visitors only (i.e., tourists = overnight visitors). The economic importance of this sector can be seen from the results of some countries where accommodation services accounted for between 15 to 20% of total internal tourism expenditure. Accommodation statistics is a key part of the system of tourism statistics in the EU and has a long history of data collection.

The scope of observation (or the target population) in accommodation statistics includes all tourist accommodation establishments providing, as a paid service (although the price might be partially or fully subsidized), short-term or short-stay accommodation services.

Tourism capacity/occupancy data is collected by the member states by means of the business survey (in some cases capacity data is available directly from tourism registers).

The indicators of tourism at regional level measured by Eurostat are divided into two main categories: Variables for capacity (including number of (1) establishments, (2) bed places, and (3) bedrooms) and variables for occupancy (including number of (1) nights spent, (2) arrivals of residents and non-residents, (3) occupancy rate of bedrooms, and (4) occupancy rate of bed places).

The indicators mentioned above are further divided by the degree of urbanization, by area (coastal and non-coastal), by type of tourist (resident or non-resident) and by unit (number, the percentage of the total, percentage change over previous period). Some indicators are reported per thousand inhabitants or km². Therefore, due to our selected regions at the NUTS 2 level, the analysis started with 50 relevant indicators (Table 2). Data were processed using SPSS 19 software.

3.2. Methods of Regional Disparities Measurement, Grouping the Regions

The methods of regional disparities measurement are based on an inter-regional comparison, or they are mathematical and statistical methods [49,50], that also include the multivariate statistical methods (method of main components, factor analysis, cluster or discrimination analysis).

To group regions with similar levels of tourism (measured by accommodation statistics), we decided to use one of the multivariate statistical methods—cluster analysis.

The cluster analysis is a statistical method used for the task of grouping a set of objects according to certain, logically selected variables. It is based on the idea of grouping, in some sense, similar objects into the groups, which differ from each other. The object in a specific cluster share many characteristics but are very dissimilar to objects not belonging to the cluster.

Table 2. Indicators of regional tourism (indicators in italics were used in cluster analysis).

	Label
Capacity of collective tourist accommodation	<i>Number of establishments—total</i>
	Number of establishments - total—PcPP
	<i>Number of establishments—cities</i>
	Number of establishments - cities—PcPP
	<i>Number of establishments—towns</i>
	Number of establishments - towns—PcPP
	<i>Number of establishments - rural areas</i>
	Number of establishments - rural areas—PcPP
	<i>Number of bed-places—total</i>
	<i>Number of bed-places—total—PcPP</i>
	<i>Number of bed-places—cities</i>
	Number of bed-places—cities—PcPP
	<i>Number of bed-places—towns</i>
	Number of bed-places—towns—PcPP
	<i>Number of bed-places—rural</i>
Number of bed-places—rural—PcPP	
Occupancy in collective tourist accommodation	<i>Net occupancy rate of bed places</i>
	<i>Net occupancy rate of bedrooms</i>
	<i>Arrivals of residents</i>
	Arrival of residents—PcPP
	<i>Arrivals of non-residents</i>
	Arrivals of non-residents—PcPP
	<i>Arrivals total</i>
	Arrivals total—PcPP
	<i>Total nights spent by residents—total</i>
	Total nights spent by residents—total—PcPP
	<i>Total nights spent by residents—cities</i>
	Total nights spent by residents—cities—PcPP
	<i>Total nights spent by residents—towns</i>
	Total nights spent by residents—towns—PcPP
	<i>Total nights spent by residents—rural</i>
	Total nights spent by residents—rural—PcPP
	<i>Total nights spent by non-residents—total</i>
	Total nights spent by non-residents—total—PcPP
	<i>Total nights spent by non-residents—cities</i>
	Total nights spent by non-residents—cities—PcPP
	<i>Total nights spent by non-residents—towns</i>
	Total nights spent by non-residents—towns—PcPP
	<i>Total nights spent by non-residents—rural</i>
	Total nights spent by non-residents—rural—PcPP
	<i>Nights spent by residents and non-residents—total</i>
	Nights spent by residents and non-residents—total—PcPP
	<i>Nights spent by residents and non-residents—cities</i>
Nights spent by residents and non-residents—cities—PcPP	
<i>Nights spent by residents and non-residents—towns</i>	
Nights spent by residents and non-residents—towns—PcPP	
<i>Nights spent by residents and non-residents—rural</i>	
Nights spent by residents and non-residents—rural—PcPP	
<i>Nights spent by residents and non-residents—per thousand inhabitant</i>	
<i>Nights spent by residents and non-residents—per km²</i>	

Note: PcPP—percentage change over previous period.

The aim of cluster analysis is to minimize the variability within clusters and maximize the variability between clusters. Unlike other reduction methods, there is no prior knowledge about which element belongs to which cluster [51–54]. The particular steps of the analysis follow:

1. Correlation matrix—testing of the correlation between variables.
2. The variables have been standardized due to the avoidance of the influence of various units.
3. To create hierarchical agglomeration clustering, the Ward method has been applied.
4. The determination of the best fitting number of the created clusters.
5. The regions were matched to the appropriate number of clusters.
6. The clustering presentation using dendrogram.

For each cluster defined, the calculations of variables' average values were performed.

At first, the correlation of all possible pairs of variables was calculated (using the Pearson Correlation Coefficient). The results showed that there were many pairs of variables with a strong correlation. However, one of the required conditions for the proper analysis is the absence of multi-correlation between variables. To meet the condition of mutually uncorrelated variables, there is an option of providing Principal Component Analysis (PCA) at the beginning. An important condition in PCA is that the number of observations should be at least five times greater than a number of variables [55]. In the beginning, we had 50 variables and only 54 observations (regions). Hence, it was impossible to run PCA. Therefore, we decided to continue the analysis with removing less important variables from the pairs with stronger Pearson correlation. This removal assured that the variables would not be mutually correlated. After that, only 13 variables of tourism (Table 2) remained and were used as input variables for clustering.

The standardization of variables was carried out before the cluster analysis because we opted to remove the influence of the tremendous differences in the variance values that was partly due to various measurement units. The standardized variables were provided in line with the formula of calculation of z-score:

$$Z_{ij} = \frac{x_{ij} - \bar{x}_j}{s_j} \quad (1)$$

where:

$i = 1, 2, \dots, n$ (n is the number of observations),

$j = 1, 2, \dots, p$ (p is the number of variables),

s_j is a standard deviation of particular variable,

\bar{x}_j is an average value of the particular variable.

The squared Euclidean distance that forms the basis of Ward's clustering method was applied to gauge the distance between observations. The calculation formula for distance is as follows:

$$d_{ij}^2 = \sum_{k=1}^p (X_{ik} - X_{jk})^2 \quad (2)$$

where:

X_{ik} denotes the value of the k th variable for the i th observation,

X_{jk} denotes the value of the k th variable for the j th observation.

To determine the optimum solution of clustering, the hierarchical cluster analysis, specifically Ward's method was used. Referring to this method, it does not rest upon the optimization of distances between clusters, as it is the case in other methods (e.g., nearest neighbor, furthest neighbor, median method, centroid method). Instead of that, it uses that analysis of the variance approach to evaluate the distances between clusters and emphasizes the minimization of the heterogeneity of the clusters. Cluster membership is assessed by calculating the total sum of squared deviations from the mean of a cluster. The criterion for fusion ΔC_1 is that it should be the smallest possible increase in the error sum of squares:

$$\Delta C_1 = \frac{n_h n_{h'}}{n_h + n_{h'}} \sum_{j=1}^p (X_{hj} - \bar{X}_{hj})^2 \quad (3)$$

where:

nh is the cardinality of cluster h ,

X_{hj} is a vector of the variable's values of the j th object in the cluster h ,

\bar{X}_{hj} is the cluster's average.

The advantage of the method is the appearance of the clusters that are less massive (smaller) and relatively alike in terms of frequencies. The method can also be characterized by the tendency of removing the clusters with the least number of observations, which is not the appreciated characteristic of the method.

4. Results of the Cluster Analysis

After researching the variables' values for the Prague region, it was found that many variables of this one single region significantly exceed the values of the remaining regions. Because extreme values are not desired in this cluster analysis, this region was excluded from the analysis. After the accomplishment of the analysis, the region of Prague was added to the remaining clusters as a separate cluster consisting of a single region.

The first output from clustering is presented by the proximity matrix. It includes the distances between each pair of regions. The highest distance (this means the highest rate of dissimilarity) was recorded between Polish region PL42_Zachodniopomorskie and two Bulgarian regions: BG32_Severen Tsentralen and BG31_Severozapaden (distance: 13,5 resp. 13,3). The lowest distance (and the highest rate of similarity) was between two Polish regions PL33_Lubelskie and PL31_Swietokrzyskie (distance = 0.85).

The results of each step in the hierarchical clustering process are depicted in Figure 3, where the values of the agglomerative coefficient are shown. These values represent the value of the distance statistics which is the means for forming the clusters. These coefficients helped us to make the decision concerning the number of clusters to choose. The number of clusters stopped with the number satisfying the condition: "Between two agglomerative coefficients are larger distances" (note: In Figure 3, they are shown by the black line). In this analysis, it was estimated at six clusters.

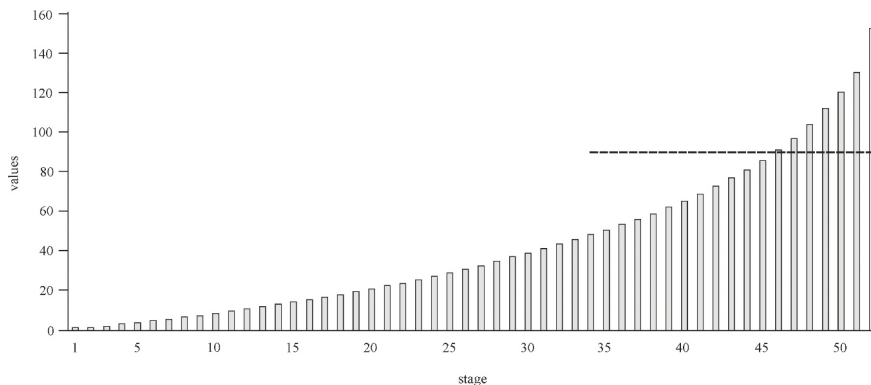


Figure 3. Cluster analysis—agglomeration schedule.

In the graphical presentation of the clusters analysis' results, we observe the joining of particular regions using a dendrogram. The dendrogram is a visual representation of the steps in a hierarchical clustering solution that shows the clusters being combined and the values of the distance coefficients at each step. Connected vertical lines designate joined cases. The dendrogram rescales the actual distances to numbers between 0 and 25, preserving the ratio of the distances between steps. The dendrogram of our clustering (Figure 4) implies (shown by black dotted line) the rising of six clusters. The arisen clusters are shown in the rectangle.

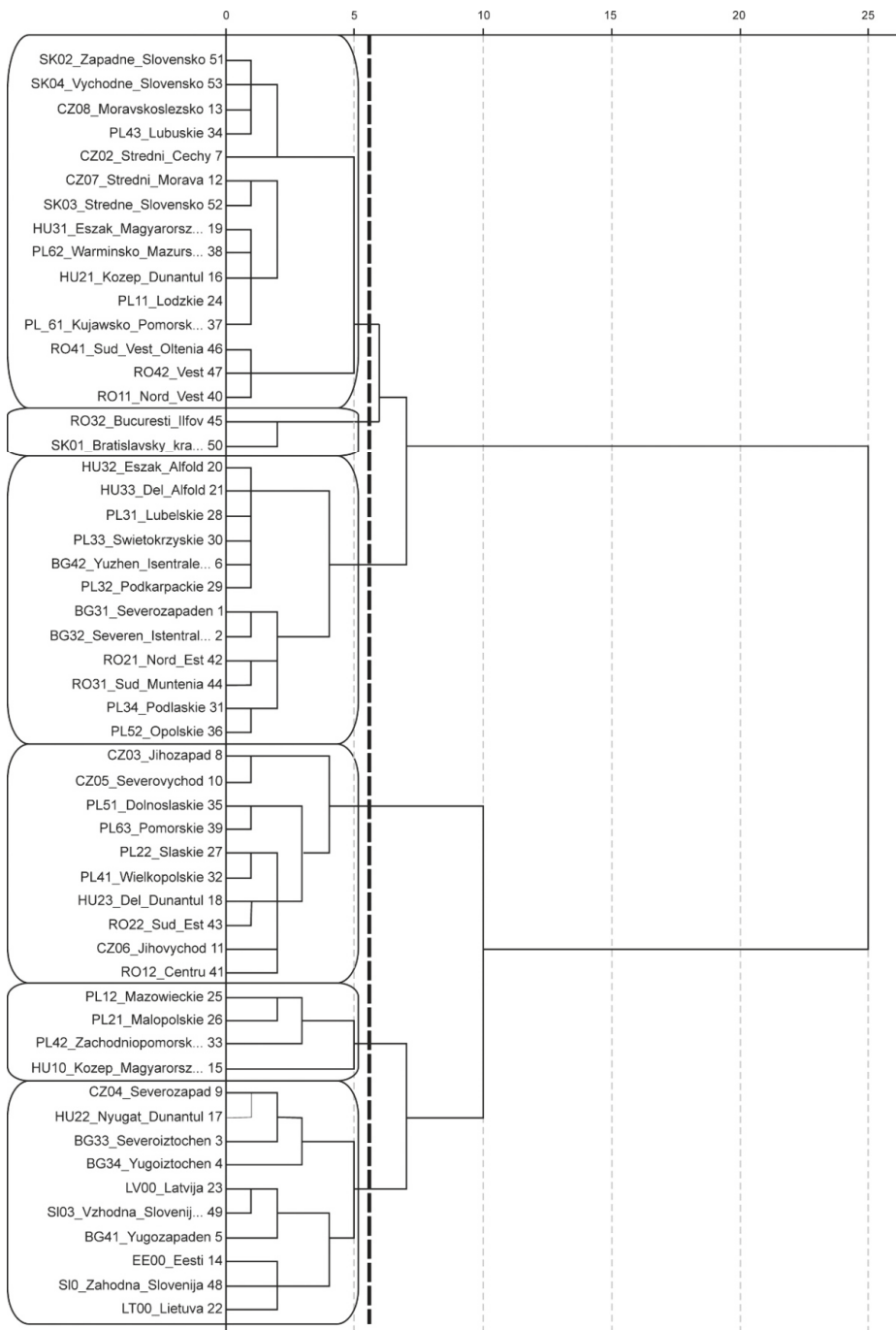


Figure 4. Dendrogram of clustering.

It is necessary to evaluate the outcome of the cluster analysis regarding the quality of the spread of the individual regions into clusters. At the same time, an appropriate number of the arisen clusters should be assessed. Both matters have already been done in the paragraph above.

The outcome itself does not have an endogenous meaning to the analyst unless it is confronted with the goals of the cluster analysis and with the known facts. The correct quantitative interpretation of the individual clusters by means of the variables' values is, therefore, important. As is the qualitative interpretation with respect to the logical explanations of the particular clusters [48,50]. Therefore, to compare among the clusters regarding individual indices their average values were used (Table 3). To the six clusters created in the analysis, the Prague region—a separate cluster—was added for the sake of the comparison.

Table 3. Characteristics of the clusters—the mean values of the variables.

	Ward Method						
	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Prague
	Mean	Mean	Mean	Mean	Mean	Mean	
NE total	409	1 068	605	1 270	939	197	757
NBP total	23 008	66 539	40 232	91 786	81 700	24 498	91 613
NBP total (PcPP)	3,8	1,6	−2,2	1,3	3,1	1,6	−4,4
NOR-BP	26	40	28	29	44	31	54
NOR-BR	33	50	40	35	55	43	65
AR-R	526 670	748 218	711 372	1 455 388	1 964 992	528 630	780 961
AR-NR	101 075	1 097 086	180 356	370 612	1 514 119	762 883	5 315 054
AR total	627 745	1 845 305	891 728	1 826 000	3 479 111	1 291 513	6 096 015
TN-R total	1 245 243	1 954 190	1 953 264	3 931 006	5 666 570	1 042 466	1 368 554
TN-NR total	224 925	3 525 509	478 193	864 634	3 807 263	1 297 787	13 381 733
NS-R-NR total	1 470 167	5 479 699	2 431 457	4 795 640	9 473 833	2 340 253	14 750 287
NS-R-NR (pTHAB)	939	3 927	1 637	2 459	3 617	2 216	11 865
NS-R-NR (pkm ²)	76	280	173	272	677	1 222	29 727

Explanations: NE total: number of establishments—total, NBP total: number of bed-places—total, NBP total (PcPP): number of bed-places—total (percentage change over previous period), NOR-BP: net occupancy rate of bed places, NOR-BR: net occupancy rate of bedrooms, AR-R: arrivals of residents, AR-NR: arrivals of non-residents, AR total: arrivals total, TN-R total: total nights spent by residents—total, TN-NR total: total nights spent by non-residents—total, NS-R-NR total: nights spent by residents and non-residents—total, NS-R-NR (pTHAB): nights spent by residents and non-residents—per thousand inhabitants, NS-R-NR (pkm²): Nights spent by residents and non-residents—per km².

Specific numbers in characteristics of the clusters (minimum value, maximum value, the coefficient of variation as the measure of relative variability) are presented in Tables 4 and 5.

Cluster 1 contains 12 regions (3 BG, 2 HU, 5 PL, 2 RO). This is the cluster of regions with the lowest average values of the indicators apart from the highest value of a number of total bed-places (percentage change over previous period) which indicates an increase of 3,8%.

Cluster 2 contains ten regions—the region with the capital city of Bulgaria and two Bulgarian coastal regions, one Czech region situated between Prague and Germany, three Baltic states and both regions of Slovenia. This cluster has the highest mean value of nights spent by residents and non-residents per thousand inhabitants (3927) and the second highest value of total nights spent by non-residents. In this cluster, the rest of the variables reaches rather higher values.

Cluster 3 is the largest cluster and contains 15 regions (3 CZ, 2 HU, 4 PL, 3 RO, 3 SK). This cluster is characterized by the low values of the variables. Among all six arisen clusters, this the only one that shows a decrease in the number of bed-places (percentage change over previous period) which indicates a decline of 2,2%. As for Cluster 3, it is a relatively homogenous group of regions.

Cluster 4 contains ten regions (3 CZ, 1 HU, 4 PL, 2 RO). This cluster features the highest mean values of the number of establishment (1270) and the number of bed places (91786), which is higher than the value in Prague (91613). This cluster is also characterized by the second highest value of arrivals of residents and the total nights spent by residents. The regions in this cluster create a homogenous group because every coefficient of variation is lower than 50%.

Cluster 5 contains one Hungarian region and three Polish regions. In this cluster, the average values of variables are the highest, i.e., second highest within the six arisen clusters. This is because this cluster contains the capital of Hungary (Budapest), the capital of Poland (Warsaw), the region with the Tatra Mountain Range in Poland and one Polish coastal region, which borders with Germany.

Cluster 6 contains two regions—the capital city of Slovakia (Bratislava) and the capital city of Romania (Bucharest). This cluster ranks the best only in the scope of one variable: Nights spent by residents and non-residents—per km² (1222).

Cluster 7—Prague—is a region on its own (Table 3).

Table 4. Cluster descriptive characteristics of total number of establishments, total number of bed-places, total number of bed-places (percentage change over previous period), net occupancy rate of bed places, net occupancy rate of bedrooms, arrivals of residents, and arrivals of non-residents.

		Indicators						
		NE Total	N-BP Total	N-BP Total (PcPP)	NOR-BP	NOR-BR	AR-R	AR-NR
Cluster 1	Mean	409	23 008	3,8	26	33	526 670	101 075
	Max	709	51 201	10	31	40	768 159	172 631
	Min	142	7 913	−1,2	17	23	231 813	26 608
	CV	47%	56%	X	16%	16%	36%	52%
Cluster 2	Mean	1 068	66 539	1,6	40	50	748 218	1 097 086
	Max	2 062	128 217	7,7	50	68	1 316 696	1 983 315
	Min	596	39 074	−6,6	29	36	461 048	617 558
	CV	52%	41%	X	14%	17%	38%	45%
Cluster 3	Mean	605	40 232	−2,2	28	40	711 372	180 356
	Max	1 064	60 982	2,2	32	69	1 022 980	303 587
	Min	283	18 211	−9,8	23	30	426 461	40 719
	CV	35%	39%	X	9%	29%	27%	38%
Cluster 4	Mean	1 270	91 786	1,3	29	35	1 455 388	370 612
	Max	2 235	153 235	5,6	37	43	1 906 310	580 736
	Min	636	42 597	−4,9	24	26	883 508	86 717
	CV	43%	43%	X	14%	14%	22%	44%
Cluster 5	Mean	939	81 700	3,1	44	55	1 964 992	1 514 119
	Max	1 418	121 617	5,4	46	60	2 702 422	3 157 529
	Min	476	47 921	1,4	42	50	895 617	543 009
	CV	53%	38%	X	4%	8%	43%	75%
Cluster 6	Mean	197	24 498	1,6	31	43	528 630	762 883
	Max	220	28 013	2,1	36	53	709 131	921 131
	Min	173	20 983	1,1	26	33	348 128	604 635
	CV	17%	20%	X	22%	33%	48%	29%

For explanations, please see Table 3.

Table 5. Cluster descriptive characteristics of total arrivals, total nights spent by residents, total nights spent by non-residents, total nights spent by residents and non-residents, nights spent by residents and non-residents (per thousand inhabitants), nights spent by residents and non-residents (per km²).

		Indicators					
		AR Total	TN-R Total	TN-NR Total	NS-R-NR Total	NS-R-NR (pTHAB)	NS-R-NR (pkm ²)
Cluster 1	Mean	627 745	1 245 243	224 925	1 470 167	939	76
	Max	924 246	2 319 053	597 848	2 493 552	1 454	140
	Min	260 184	445 921	56 308	502 229	521	26
	CV	36%	45%	73%	44%	36%	47%
Cluster 2	Mean	1 845 305	1 954 190	3 525 509	5 479 699	3 927	280
	Max	3 087 070	3 431 178	6 579 840	8 560 753	8 048	658
	Min	1 208 553	1 282 484	1 799 696	3 435 008	1 614	64
	CV	35%	33%	43%	27%	57%	70%
Cluster 3	Mean	891 728	1 953 264	478 193	2 431 457	1 637	173
	Max	1 192 931	3 100 551	1 004 297	3 449 343	2 821	374
	Min	483 483	952 851	85 307	1 201 907	755	53
	CV	23%	30%	59%	28%	41%	58%
Cluster 4	Mean	1 826 000	3 931 006	864 634	4 795 640	2 459	272
	Max	2 416 382	6 023 550	1 382 127	7 093 131	4 200	509
	Min	1 052 713	2 385 487	324 571	2 979 240	911	105
	CV	23%	30%	40%	29%	46%	49%
Cluster 5	Mean	3 479 111	5 666 570	3 807 263	9 473 833	3 617	677
	Max	4 053 146	9 093 763	7 445 571	11 919 404	7 047	1 335
	Min	2 247 662	1 784 343	2 115 202	6 579 854	1 243	185
	CV	24%	57%	64%	24%	68%	71%
Cluster 6	Mean	1 291 513	1 042 466	1 297 787	2 340 253	2 216	1 222
	Max	1 630 262	1 123 459	1 537 443	2 660 902	3 266	1 461
	Min	952 763	961 473	1 058 131	2 019 604	1 166	984
	CV	37%	11%	26%	19%	67%	28%

For explanations, please see Table 3.

5. Discussion and Concluding Remarks

The cluster analysis is linked to the factor analysis as characterized previously, in the part on the methodological considerations. Clustering can be ignored in two ways: Disaggregation and aggregation [55]. In that respect, one needs to understand the consequences of such ignoring. It may lead to different results in CFA, such as inflated chi-square statistics or decreased standard errors. Therefore, it is recommended to follow the methodology of multilevel CFA (MCFA).

Even more detailed analysis is then achieved by employing some modeling approaches for analyzing the partially nested data [56]. Similarly, the modeling and visualization of the data may differ using and combining various tools, such as the business intelligence system together with the geographical information system, cartography contours, etc.

This article points out the fusion of regions of Central and Eastern Europe into clusters according to the selected indicators of tourism which Eurostat uses to evaluate tourism. In this regard, for such clusters, as presented in this paper, the definition of the South East England Development Agency (SEEDA) [57] states that “a cluster is a progressive form of business network, which has strong business objectives focusing on improving sales and profits”, is more applicable. Data on such clusters, as presented in this paper, can be used in the effective planning and decision-making for the destination management [58] to support the sustainable development of tourism in a specific region. The data can also be used as a relevant base for potential future cooperation between various regions from one cluster to support tourism competitiveness and sustainable development [59–61].

However, the destination management strongly relies on actual data analyzed and composed of several indices in the demand or supply side of the tourism market. The demand (variables for

occupancy) and supply (variables for capacity) side were presented in both the theoretical and practical point of view applied to the tourism industry. Demand and supply data reflect some of the actual requirements of the destination business, and the related destination business intelligence system (DBIS) [14–16,62]. These data represent inputs to the system. The output of the system is, besides others, clustering as presented in this paper. Within the DBIS, the data used for clustering may also be visualized via a geographical information system tool in order to provide recommendations in the field of decision-making and future planning for both destination managers and stakeholders in a specific destination and thus contribute to the sustainable development of the region.

The link between clustering, as presented in this paper on the example of the East and Central European countries' tourism industry at the NUTS 2 level, and tourism sustainability can be explained via serendipity [63–65]. According to Hom Cary [66] "serendipity in tourism is the effect by which one accidentally stumbles upon something fortunate, especially while looking for something entirely unrelated". However, serendipity [67] or a pilgrimage-like experience in traveling can happen only when potential tourists start to move from place to place, from region to region (e.g., Visegrad–V4 countries), from one cultural space to another. According to the Inglehart map [68], Poland is closer to India, the Czech Republic is closer to Germany and Slovakia to Taiwan and Hungary to Macedonia [68,69]. This supports the idea of clustering based on criteria of importance (e.g., sustainability criteria, number of nights spent or number of tourists, specific indicators given by international companies and/or agencies, e.g., Eurostat, UNWTO, etc.). It changes the traditional view on clusters in tourism [4,18,25,29,59–61,70] and allows one to see new solutions for a specific sector of the economy that tourism undoubtedly is. Bearing in mind that "in most economic activities, it is the product that reaches the consumer, but when it comes to tourism, it is the opposite in that the consumer seeks for tourism services. Because of this characteristic, tourism has a heavy impact on local development" [21]. In this paper, the clusters were identified based on following points

- Place vs. people (variable: numbers of establishments—cities, urban areas, where people look for their touristic utilities), this suggests where the impact on sustainability can be stronger.
- Product vs. people (number of nights spent by non-residents as variable set in the regions), this suggests the strength(cardinality) of the impact on sustainability.
- Participants vs. people (number of bed places) can lead to some estimations of overuse, e.g., of laundry.

However, some limitations of the study should be acknowledged:

1. Results of the study presented in this paper reflect one specific type of territorial unit for statistics as a region within Europe. Recommendations towards specific clusters defined within the study may differ at lower territorial units (NUTS 3). Hence, further study of this issue in different countries or regions all around the world is required to achieve more representative and applicable results.

2. Use of more Eurostat tourism indicators in the cluster analysis may result in more accurate outputs. Potentially, in some cases, it may lead to changes within clusters and/or the number of clusters.

Nevertheless, the presented approach represents a pilot study in this field for mathematical modeling. Further investigation of the possibilities of including complementary data, e.g., on environmental indicators published under the European Union's INSPIRE initiative [71] and European Union's Earth Observation Programme Copernicus [72] is necessary to develop this method at both a theoretical and practical level, as the results may be applicable within the tourism sustainable development European Union wide; and elaborate the use of the European Union's toolkit for sustainable destinations [73].

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Article

Economic Valuation of Green Island, Taiwan: A Choice Experiment Method

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Abstract: The evaluation of ecological security and ecosystem services is now a core issue in the field of natural and environmental resources. Quantifying the economic value of island ecosystem services can inform policy decisions that affect the island and help justify expenditures on ecosystem service improvements. This study investigates the preferences of residents and tourists regarding Green Island and estimates willingness-to-pay (WTP) values for island ecosystem services using a choice experiment. The results indicate significant differences between the preferences of residents and tourists regarding island environmental resources. Therefore, based on the multiple attributes and ecosystem services, this study formulated three assessment schemes: “environmental protection”, “recreational development”, and “integrated operation and management”. Based on our analysis of the problems reflected in the aforementioned valuation models, we recommend that policy makers refer to environmental attribute preferences to create statements or advertisements targeting relevant audiences when planning island development. This paper contributes to the literature by demonstrating how the economic valuation of island ecosystem services can help design and target island conservation policies in order to maximize welfare.

Keywords: tourism; sustainability; climate change; choice experiment; islands

1. Introduction

Increased demands for tourism and recreational resources, as well as a more holistic understanding of sustainability, have led to the rapid development of island tourism. This, in turn, has given rise to research on island development. This, in turn, has given rise to research by scholars who are concerned about island development [1,2]. For example, Scheyvens and Momsen [3] noted that small, developing islands, because of their economic vulnerability, typically use an expanding tourism industry to stimulate economic development [4,5]. Moreover, Li and Yang [6] suggested that coastal overdevelopment, ecological resource destruction, and pollution are unavoidable consequences of island tourism development. Occupational behaviors also arise—such as occupying land for accommodation and water recreational activities—which greatly destabilize the traditional lifestyles of local communities. Since tourism development also creates restrictions with regard to area coverage, natural resources, fragility, disaster recovery capability, and the economy, tourism and recreational services negatively affect the island’s environmental, social, and cultural aspects [7–11].

With 1141 km of coastline, Taiwan has abundant marine resources. An emerging tourist destination, island tourism in Taiwan is attracted by ecological, historical, and cultural features. In particular, Green Island has rich geological and topographical features (coastal terrains, coral reefs);

distinctive biological and ecological resources (green sea turtles, flying fish, coconut crabs); and traditional festivals and activities (flying fish festival). Diverse theme-based tours have gradually developed on Green Island, including natural ecology-based tours and relevant experience activities (snorkeling, whale watching, night observation of flying fish). Supported by government policies, island tourism and tribal tourism have become new tourism trends in Taiwan with significant potential for future development. However, tourism growth has also had negative environmental consequences. The construction of coastal embankments can severely damage the coastal environment and destroy biological habitats. Moreover, the introduction of foreign cultures can potentially weaken traditional culture. Given the fragility of island ecosystems, policy makers should develop state land for environmental and cultural protection/conservation while also developing unique ecological and cultural experiences to promote tourism. The development of sightseeing resources must consider sustainable ecological, economic, and social development, while minimizing the impact of recreational activities on the environment. Thus, the adoption of sustainable operating principles and environmental conservation is an important aspect of island tourism development.

Chapin et al. [12] suggested that ecosystem services and biological diversity are important intermediaries between the economic environment and human systems. Further, de Groot et al. [13] argued that in order to value ecosystems, we must first consider ecological, sociocultural, and economic values, and then assess the overall value as a reference for environmental decision-making and management. Barbier et al. [14] estimated the value of ecosystem services such as wetlands, mangroves, coral reefs, seagrass beds, and sandy beaches. Based on changes in land use, Bateman et al. [15] explored the contribution of ecosystem services and ecosystems. Taking four ecological zones in Hangzhou, China, as the research object, Su et al. [16] investigated the effect of landscape pattern and value changes in ecosystem services on urbanization. Maes et al. [17] calculated the value of ecosystem services and used average species richness and species diversity to measure biodiversity.

Due to changes in land-use patterns, the ecosystem functions of natural areas have gradually weakened, and biodiversity has decreased. Ecosystem goods and services provide social benefits such as water supply, recreational activities, and carbon storage [18–20]. Therefore, exploring policies related to changes in land-use patterns, and assessing the benefits of environmental development and protection are important matters of public concern [21]. Given the current situation of Green Island, a complete assessment model for ecosystem services should consider spatial variables such as natural landscape coverage, ecotourism patterns, and land-use patterns. Value functions for assessing ecosystem services should then be constructed and monetized.

Sustainable tourism management is usually conducted in places with high environmental sensitivity, where detailed economic analyses of financial gains vis-à-vis environmental impact are performed prior to developing the area for tourism. Such analyses can support decision making related to the planning, utilization, and sustainable operation of local ecological resources. In the case of Green Island, the conservation efficiency of its eco-environmental resources can only be valued by using non-market goods valuation methods. These methods are classified into two types: revealed preference (RP) and stated preference (SP). In such instances, RP can be used to tease out the values embedded in observed prices. RP directly investigates actual behaviors or results in the target market by using questionnaires. Common RP methods include the traveling cost method (TCM) and the hedonic price method (HPM). Each approach has a different conceptual basis, and can be used to value different environmental goods. However, they all share the common feature of using market information or behavior to infer the economic value of an associated non-market impact [22]. TCM is one of the most common methods used in non-market valuation to estimate the recreational values of specific sites [23]. Bertram and Larondelle [24] used TCM to assess the recreational value of forest ruins, while Plant, Rambaldi, and Sipe [25] used HPM to evaluate residents' preferences for tree coverage on urban streets.

The method of stated preference (SP) investigates results that have not yet occurred in the target market to obtain preference data from respondents. SP surveys individual or household preferences

and, more specifically, willingness to pay (WTP) for changes in the provision of (non-market) goods, which are related to respondents' underlying preferences. Hence, this technique is of particular value when assessing the effects on non-market goods, the value of which cannot be uncovered by RP methods [22]. SP methods include the contingent valuation method (CVM) and the choice experiment method (CEM). Mark and Swait [26] suggested that SP can overcome certain disadvantages of RP—such as insufficient collinearity between variables and the extent of variation—to make the assessment of parameters more explanatory and clearly reflect respondents' true preferences.

CVM has been widely used to evaluate environmental amenities and damage [27–29]; however, it has several biases. For example, respondents may deliberately conceal their true preferences for non-market goods favoring their personal interests, possibly resulting in strategic biases such as the overestimation or underestimation of value. When a separate inquiry is made for goods, or a mixed inquiry is made for goods, the embedding effect will produce a bias between the values estimated. In the designed questionnaire, the explanatory information and alternative options provided for the study objects are insufficient, creating an information effect. Moreover, when the double-bounded dichotomous choice method is adopted, respondents may ignore the question content because of their own subjective views, and tend to give the same answers to all of the questions, thereby producing an acquiescence bias. The bidding game requires setting a starting price for goods, and that price is used as a benchmark for respondents' comments, which could produce a starting point bias [30].

CEM has become one of the main valuation methods for studying preferences for natural resource conservation. It is also an important preference valuation method for valuating non-market goods [31]. In this regard, Liekens et al. [21] noted that CEM assesses the use and non-use values, defines a hypothetical market by using questionnaires to explore public preferences for landscape conservation and natural development, and further reflects WTP for environmental goods (or services). One widely applicable strategy for valuating these services is to conduct an analysis of all of the various factors determining the output of a good, thereby assessing the contribution of the ecosystem services to the production of that good [23].

The most significant difference between CVM and CEM is that the former can only consider the characteristic attributes of natural resources as a whole commodity for separate value analysis; meanwhile, the latter can distinguish and analyze the multiple attributes of natural resources [32]. As CEM can be used to evaluate multiple attributes and levels, different alternative plans can be combined on the basis of important characteristics associated with non-market goods or services, and choice sets are assumed for different scenarios. In this case, respondents can choose appropriate alternative plans according to their preferences, thus avoiding assessment biases [33]. Therefore, CEM can better solve the problem of comparing profit and loss between the multiple attributes of ecosystem services, and it can reveal public preferences for each eco-functional attribute of ecosystem services [34]. Thus, CEM has been widely used for non-market valuation, including species conservation [35–39], wetland recovery [40–44], ecotourism preferences [45–50], tourists' preferences for land, the environmental functions of national parks [21,39–41,51,52], and the exploration of methods for altering specific ecosystem services to affect economic benefits [34,53–58].

Remoundou et al. [59] employed CEM to evaluate the effects of climate change on WTP for the Santander coastal ecosystem. The study attributes included biodiversity, jellyfish blooms, closed beach days, beach size, and annual household expenditures. Mejía and Brandt [49] used CEM to interview tourists visiting the Galapagos Islands about their WTP for protective measures against invasive species. Their attributes included the depth of experience with the islands' ecosystems, length of stay, level of protective measures taken against invasive species, and price of island tourism. They found that tourists visiting the Galapagos Islands highly valued biodiversity and were marginally willing to pay USD 2543 for better protective measures. Schuhmann et al. [60] employed CEM to evaluate the tourist preferences and WTP for coastal attributes in Barbados. Their attributes included price, type of accommodation, beach width, distance from beach, and beach litter. Cazabon-Mannette et al. [61] used CEM and CVM to evaluate the non-use value and non-consumptive value of sea turtles in Tobago. Their attributes

included price, number of sea turtle sightings, fish diversity (number of species), coral cover, and degree of congestion (number of divers). Xuan et al. [62] used a discrete choice experiment (DCE) to evaluate tourists' WTP for boat tours in the marine-protected area of Vietnam's Nha Trang Bay. Their attributes included coral cover, environmental quality, fishermen's unemployment, and increase in ticket prices. Finally, Peng and Oleson [63] employed DCE to evaluate beach recreationalists' preferences and WTP for improving water quality in Oahu's beaches. Their attributes included water quality, water turbidity, coral cover, fish diversity, and WTP for motor vehicles.

Conditional logit (CL) can be used to estimate the average preferences of tourists from multiple attributes of island tourism and estimate the marginal WTP (MWTP) for these attributes [49,50]. The random parameter logit (RPL) model can reflect the different responses of respondents from different backgrounds toward different attributes. This can be used to examine the heterogeneous preferences of respondents and their WTP for changes in the levels of various attributes (such as folk, cultural, and ecological experiences) [64–66]. To segment a clearer target market, the latent class model (LCM) can segregate respondents into different groups and examine and compare their preferences and group differences (e.g., island tourism preferences, attitudes, and socioeconomic backgrounds) [45]. Based on the aforementioned studies, we can see that the empirical CEM models of CL, RPL, and LCM have been verified for use in the examination and evaluation of multiple attribute preferences for island tourism sites.

These studies show that CEM can be used to construct a multiple attributes utility function for natural resources and the environment to estimate the economic value of goods and services associated with environmental resources. These can include valuation for the conservation and improvement of endangered species populations, service planning and valuation for recreational facilities, and preferences for wetland ecoregion planning. For biodiversity conservation, conservation preferences for different endangered species and the improvement of endangerment levels are the main objectives of species conservation. Establishing a recovery fund system is also an important factor in conservation policies.

In summary, this study assesses the ecosystem service valuation pattern for Green Island. First, the motivation for the study is discussed, and the study objective is proposed. Second, according to the indicators of the ecosystem services of Green Island's ecosystem units, important ecosystem attributes and levels are identified through interviews with relevant experts and researchers, and the attributes and levels of ecological security that were designed into the implementation of the ecological security model are incorporated. Third, CEM is used to construct an ecosystem service assessment utility model. Tourists and residents are categorized into different groups for the questionnaire, and their responses are analyzed to explore differences in WTP for various attributes. Unlike previous studies performed within or outside of Taiwan, this study incorporates the ecological, environmental, and recreational attributes of islands into CEM, and involves the economic benefits of multiple attributes. Finally, based on the results, countermeasures and suggestions are proposed for the sustainable development of the Green Island environment, providing a reference for policy makers to make more efficacious policies.

2. Materials and Methods

2.1. Description of Green Island

Green Island, the target area of this study, is located to the southeast of Taiwan island (Figure 1), with a total land area of about 16 km². Over 3700 people currently live on the island, and its traditional industries are agriculture and fishing. The island has long experienced population decline and aging. Green Island has a great variety of terrain (volcanic island, coastal coral reef); marine ecology; and cultural-historical monuments. In 1995, the Pacific Economic Cooperation Council selected Green Island as an ecotourism development site, suggesting that Green Island should develop into an eco-resort island. Green Island is gradually transforming its local industrial structure to become

more tourism-focused. According to the Tourism Bureau [67], the number of tourists to Green Island increased from 59,383 in 1991 to 345,622 in 2017, which was a growth rate of 482%. Tourism is now an important industry on the island.



Figure 1. Map of the study area.

Due to the fragility of the island ecosystem, offshore development should focus on environmental conservation and cultural preservation, with special ecological and cultural experiences as the main focus. Therefore, the development of tourism resources must consider sustainable ecological, economic, and social development, while reducing the negative impacts of recreation. It is important to ensure that the tourism industry develops under sustainable management and assists ecosystem conservation. For example, Green Island authorities have been implemented to protect environmental resources and reduce resource losses through the development of low-carbon tourism and intertidal zone ecological conservation, along with other measures. However, some conservation plans remain controversial. Therefore, the motivation for this study stems from important environmental protection issues such as biodiversity and the ecological security level.

2.2. Construction of a Utility Model for Valuating Ecosystem Services

2.2.1. Multiattribute WTP Valuation Model

CEM was used to construct an ecosystem service assessment utility model for Green Island. An RPL model was used to account for differences between respondents' preferences for attributes in different areas of the island. This model can reflect differences between the preferences of respondents as well as the WTP for different attributes.

CEM is a random utility model that can be used to explore the MWTP for all of the attributes and levels [68]. In the binary model, the utility of the n th respondent is assumed to be determined by the various options the respondent faces (U_{ni}), and these options are used to maximize utility, as shown in Equation (1):

$$U_{ni} = V_{ni} + \epsilon_{ni}, \quad (1)$$

where U_{ni} represents the attribute of the n th respondent facing the i th option, V_{ni} represents the observable part of the utility function, and ϵ_{ni} represents the residual item (i.e., the unobservable part).

This study explores differences in preferences and WTP between respondents from different social and economic backgrounds, given various attributes and levels. The analysis was conducted using a random parameters logit (RPL) model. The overall utility of the RPL model is as follows:

$$U_{ni} = V_{ni}(X_{ni}, S_n) + I_{-ni}, \quad (2)$$

where V_{ni} is the utility coefficient of observable variable X_{ni} , and respondent characteristic S_n and represents the respondent's preference.

To estimate the relative importance of all of the attributes of the product in terms of value, it is assumed that the degrees of various attributes in the alternative plan remain the same. Then, the marginal change in WTP for the k th attribute can be given by Equation (3):

$$WTP = \frac{-I2_k}{I2_c}, \quad (3)$$

where $I2_k$ is the parameter on attribute k , and $I2_c$ is the parameter on the payment tool.

2.2.2. Attribute and Level Assessment Design

Utilizing previous reports on Green Island along with conducting interviews with experts from various fields, six attributes were selected: land-use pattern, natural landscape coverage, biodiversity, ecotourism model, ecosystem conservation trust fund, and the ecological security level, which was designed in the implementation result of the abovementioned ecological security model, and was also considered an attribute. Table 1 lists the setting and details of these six attributes.

Table 1. Multiple attributes utility assessment indicators for Green Island.

Attribute	Level and Current Situation	Ecosystem Service Function	Level Quantity
Land-use pattern (LUP)	LUP± LUP+	1. Maintain the current situation 2. Increase land use (develop or transform the purposes of the original land)	2
Natural landscape coverage (NLC)	NLC± NLC+ NLC−	1. Maintain the current situation 2. Increase natural landscape coverage 3. Reduce natural landscape coverage	3
Biodiversity (BIO)	BIO± BIO+	1. Maintain the current situation 2. Increase the species recovery plan	2
Ecotourism model (EM)	EM± EM+	1. Maintain the current situation 2. Carry out an environmental education program	2
Ecological security level (ESL)	ESL± ESL+ ESL−	1. Maintain the current situation 2. Secure status (in which the ecosystem is not affected and there are few ecological disasters) 3. Warning status (in which the ecosystem is damaged to some extent and ecological disasters sometimes occur)	3
Ecosystem conservation trust fund (FUND)	FUND	1. Free of charge (maintain the current situation) 2. NTD250/person/yr ¹ 3. NTD500/person/yr 4. NTD1000/person/yr	4

¹ NTD, new Taiwan dollar (1 NTD = 0.033 USD = 0.028 Euros).

This study constructed a multiple attributes utility assessment model for Green Island, and incorporated the six indicators of the empirical model. The attributes and levels of Green Island were further explored to estimate the MWTP for multiple attributes of Green Island. The results will elucidate the preferences and attitudes of tourists and local residents toward multiple attributes

of Green Island in order to achieve sustainable management goals, such as tourist experience and resource protection.

2.3. Preference Selection Combinations for Choice Sets for Green Island Ecosystem Services

After defining the multiattribute utility assessment indicators and the attributes’ various levels for the Green Island ecosystem services (Table 1), the choice experiment (CE) evaluation process was used to further describe the preference selection combinations for choice sets to provide a reference for questionnaire and sampling designs. To understand residents’ and tourists’ multiattribute preferences for Green Island ecosystem services, a more precise improvement plan and the preference for each attribute level needed to be more clearly defined. The arrangement combinations of the various attributes and their levels produced 288 possible factor combinations ($2 \times 3 \times 2 \times 2 \times 3 \times 4 = 288$).

To develop a questionnaire, we used an extensively-used, orthogonal design method (using SPSS), [69]. Using this method, the 288 combinations were reduced to 30 combinations of alternative programs and one status quo alternative. The status quo alternative was included in various choice sets, with each choice including two randomly numbered alternative programs and one status quo alternative. The level of the attribute for the status quo alternative was presented as the current program along with its information. Each questionnaire included the three selected choice sets, and each choice set contained six programs. Thus, there were five versions of the questionnaire. Through the design process and the combination of the aforementioned choice sets, the statistical efficiency of the design of choice sets was improved [45]. Therefore, after deciding on the total number of samples, each respondent randomly selected one questionnaire version for completion.

Each respondent was asked to fill in their answers—that is, select one of the three choice sets (the two alternative programs and one status quo alternative). If the respondent was unable to decide, he or she could select “uncertain;” then, this choice set was considered as a missing value. The various attributes of Green Island ecosystem services and their levels (Table 1), and the content of the choice sets for Green Island preferences (Table 2), were explained to each respondent. This was to help respondents understand the content of the preference attributes of the Green Island ecosystem services before they selected their preferences.

Table 2. Example of a choice set for Green Island preferences and programs.
















A	Program 1	Program 2	No Program
Land-use pattern	 Maintain the current situation	 Increase land use	 Maintain the current situation
Natural landscape coverage	 Increase coverage	 Reduce coverage	 Maintain the current situation

Table 2. Cont.

A	Program 1	Program 2	No Program
Biodiversity	 <p>Increase the species recovery plan</p>	 <p>Maintain the current situation</p>	 <p>Maintain the current situation</p>
Ecotourism model	 <p>Maintain the current situation</p>	 <p>Carry out an environmental education program</p>	 <p>Maintain the current situation</p>
Ecological security level	 <p>Warning status</p>	 <p>Secure status</p>	 <p>Maintain the current situation</p>
Ecosystem conservation trust fund	NTD 500/person/yr	NTD 1000/person/yr	Free of charge
Which policy do you most prefer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2.4. Survey Design

Green Island respondents were interviewed in early September 2017 using an initial questionnaire. This questionnaire was then modified based on conservation and management status, expert opinion and advice, and the initial results. Interviews using the final questionnaire were conducted from April to June 2018. A random sampling method and face-to-face interviews were utilized to reduce questionnaire error and help respondents understand the questions. The sampling sites were distributed across the Green Island area, and the respondents were divided into two groups: local residents and tourists. A total of 840 tourists and 420 local residents were interviewed. After incomplete questionnaires were removed, 1021 valid questionnaires remained, representing 81.03% of the total questionnaires. The respondents comprised 653 tourists and 368 local residents (Table 3).

Of the total sample, 517 respondents (50.64%) were female; 577 (56.51%) were single; 444 (43.49%) were married; 276 (42.51%) were aged 30–39 years; 267 (26.15%) were aged 20–29 years; 562 (55.04%) had a university degree; and 281 (27.52%) had a high school degree. Further, 407 (39.86%) earned 20,001–40,000 NTD per month, and 370 (36.24%) earned 40,001–60,000 NTD per month.

Table 3. Sociodemographic and economic characteristics of the respondents.

Description		Tourists		Local Residents	
		Number	%	Number	%
Gender	Male	317	48.55	187	50.82
	Female	336	51.45	181	49.18
Marital status	Single	371	56.81	206	55.98
	Married	282	43.19	162	44.02
Education	High school	84	12.86	197	53.53
	University	418	64.01	144	39.13
	Master's	151	23.12	27	7.34
Age (yr)	20–29	229	35.07	38	10.33
	30–39	328	50.23	106	28.80
	40–49	74	11.33	125	33.97
	50–59	19	2.91	81	22.01
	≥60	3	0.46	18	4.89
Monthly income (NTD) ¹	<20,000	121	18.53	71	19.29
	20,001–40,000	214	32.77	193	52.45
	40,001–60,000	282	43.19	88	23.91
	≥60,001	36	5.51	16	4.35

¹ NTD, new Taiwan dollar (1 NTD = 0.033 USD = 0.028 Euros).

3. Results

3.1. Analysis of Preferences and Benefits of the Green Island Environmental Resource Attributes

Random parameter logit models were used to analyze tourists' and residents' choice preferences and WTP for Green Island conservation schemes. All of the valuation models passed the goodness-of-fit test and were significantly above the critical value, indicating that the attributes that were selected in this study had sound explanatory capability [70]. Table 4 shows that tourists and local residents had their own preferences for attributes such as "land use", "natural landscape", "biodiversity", "environmental education", and "ecological security level". The RPL model revealed the environmental preferences of each group.

Several factors influenced tourists' environmental preferences (results were significant at the 1% level). (1) The coefficient of land use was negative and significant, indicating that increasing land-use results in a decrease in tourists' utility level; (2) the coefficient of increasing the natural landscape was positive and significant; (3) the coefficients of increasing biodiversity and environmental education were positive and significant, meaning that the species restoration scheme and the increase in the environmental education scheme could raise tourists' preferences for Green Island ecosystem services; and (4) regarding ecological security, the interviewees showed a significant preference for ecological improvement.

The following factors influenced residents' environmental preferences (results significant at the 1% level): (1) The coefficient of land use was positive and significant, indicating that developing or changing land-use patterns could raise the utility level for local residents; (2) the coefficient of increasing the natural landscape coverage was positive, meaning that local residents' utility level could rise with an increase in natural landscape coverage; (3) the coefficients of increasing biodiversity and environmental education were positive, demonstrating that the species restoration scheme and the increase in the environmental education scheme could raise residents' preferences for Green Island's ecosystem services; (4) a relationship was found between improving ecological security and preventing ecological damage, indicating that the utility level of local residents increases with improvements in ecological security.

Table 4. Results of the random parameter logit model.

Variables and Levels	Tourists				Local Residents					
	Coeff.	t-Statistic	Coeff. Std	t-Statistic	WTP	Coeff.	t-Statistic	Coeff. Std	t-Statistic	WTP
ASC	-0.60686	-3.70 ***	1.20282	9.49 ***	-2758.45	1.27950	5.02 ***	0.08835	0.62	2611.22
LUP+	-0.22413	5.63 ***	0.07873	1.91 *	-1018.77	1.23954	15.76 ***	0.12461	2.37 **	2529.67
NLC+	0.56341	8.71 ***	0.03905	0.79	2560.95	0.80064	8.30 ***	0.09919	1.12	1633.96
NLC-	-0.47098	-6.72 ***	0.02093	0.40	-2140.82	-0.66028	-6.59 ***	0.03658	0.34	-1347.51
BIO+	0.47061	11.87 ***	0.01952	0.47	2139.14	0.17376	2.58 ***	0.05111	0.79	354.61
EM+	0.26344	6.35 ***	0.02676	0.62	1197.45	0.24647	4.05 ***	0.03173	0.49	503
ESL+	0.15870	2.57 **	0.30736	4.88 ***	721.36	1.44153	11.78 ***	0.00480	0.07	2941.9
ESL-	0.06180	0.95	0.05081	1.10	-	-0.63198	-5.74 ***	0.30378	3.05 ***	-1289.76
FUND	-0.00022	-3.94 ***	-	-	-	-0.00049	-2.61 ***	-	-	-
Number of choice sets	1959					1104				
Log likelihood ratio	-1664.084 ***					-775.97 ***				
Chi square	976.20					873.79				

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. WTP, willingness to pay; NTD, new Taiwan dollar (1 NTD = 0.033 USD = 0.028 Euros); ASC, alternative specific constant; LUP, land-use pattern; NLC, natural landscape coverage; BIO, biodiversity; EM, ecotourism model; ESL, ecological security level; FUND, ecosystem conservation trust fund.

Tourists' WTP was highest for increasing and maintaining the natural landscape (2561 NTD/person/yr), followed by increasing the species restoration scheme (2139 NTD/person/yr), increasing environmental education (1197 NTD/person/yr), reducing changes in land-use patterns (1018 NTD/person/yr), and healthy ecological levels (721 NTD/person/yr). Tourists were also willing to pay an average of 2140 NTD/person/yr to maintain natural landscapes and prevent resulting damage.

Residents' WTP was highest for upgrading ecosystem security to a healthy level (2942 NTD/person/yr), followed by changes in land-use patterns (2530 NTD/person/yr), increasing natural landscape coverage (1634 NTD/person/yr), increasing environmental education (503 NTD/person/yr), and the species restoration scheme (355 NTD/person/yr). Additionally, local residents were willing to pay an average of 1348 NTD/person/yr for conservation and planning to prevent damage to natural landscapes, and they were also willing to pay an average of 1290 NTD/person/yr for conservation and planning to prevent damage to ecological security.

3.2. Difference Analysis of WTP for Resource and Environment Attributes

Cross-analysis of the resource and environment attributes and the respondents' social variables indicated that tourists had differences in preferences for the two attributes of "increasing land use" and "healthy ecological security level"; meanwhile, local residents had differences in the preference for "damaged ecological security level" (Table 4). In other words, the interviewees had different preferences for environmental protection because of their respective positions. Tables 5 and 6 show the resulting correlations between socioeconomic background and WTP when socioeconomic background is taken into consideration regarding interviewees' WTP for the above attributes.

Table 5. Relationship between socioeconomic background and WTP for increase in land use.

Socioeconomic Characteristics		Tourists				Local Residents			
		Number	Mean WTP (NTD)	t-Statistic	F-test	Number	Mean	t-Statistic	F-Test
Marital status	Single	371	-2143.21	-0.950	-	206	2541.57	0.095	-
	Married	282	-2137.76			162	2538.26		
Education	High school	84	-2129.88	-	37.670 ***	197	2544.07	-	3.279 **
	University	418	-2137.71			144	2534.40		
	Master's	151	-2201.15			27	2541.62		
Age (yr)	20–29	229	-2136.27	-	9.429 ***	38	2539.27	-	0.723
	30–39	328	-2137.26			106	2541.25		
	40–49	74	-2144.17			125	2536.76		
	50–59	19	-2233.13			81	2542.07		
	≥60	3	-2217.28			18	2549.62		
Monthly income (NTD)	<20,000	121	-2152.91	-	2.856 **	71	2551.57	-	5.510 ***
	20,001–40,000	214	-2141.86			193	2538.96		
	40,001–60,000	282	-2132.89			88	2531.09		
	≥60,001	36	-2156.76			16	2552.79		

** $p < 0.01$; *** $p < 0.001$. WTP, willingness to pay; NTD, new Taiwan dollar (1 NTD = 0.033 USD = 0.028 Euros).

Among tourists aged 50–59, highly educated, high-income tourists preferred to reduce changes in land patterns and land use, whereas highly educated, high-income tourists aged 30–39 preferred improvements in the ecological security level. Local residents with lower educational levels and monthly incomes between 20,000–60,000 NTD preferred changes in land patterns to improve land use. Regarding maintaining the ecological level, local residents with high educational levels and high income more actively supported protecting and maintaining ecological security.

Table 6. Relationship between socioeconomic background and WTP for the healthy ecological security level.

Socioeconomic Characteristic	Tourists				Local Residents				
	Number	Mean WTP	t-Statistic	F-test	Number	Mean WTP	t-Statistic	F-Test	
Marital status	Single	371	514.26	−0.142	−	206	−1438.60	−1.196	−
	Married	282	526.19			162	−1385.77		
Education	High school	84	109.57	−	9.154 ***	197	−1356.24	−	11.697 ***
	University	418	438.51			144	−1431.75		
	Master's	151	631.00			27	−1759.11		
Age (yr)	20–29	229	483.71	−	4.850 ***	38	−1537.90	−	1.558
	30–39	328	655.56			106	−1446.65		
	40–49	74	381.40			125	−1382.14		
	50–59	19	374.31			81	−1359.12		
	≥60	3	281.84			18	−1455.81		
Monthly income (NTD)	<20,000	121	338.46	−	2.170 *	71	−1359.80	−	9.156 ***
	20,001–40,000	214	505.03			193	−1366.72		
	40,001–60,000	282	574.30			88	−1481.75		
	≥60,001	36	783.13			16	−1883.08		

* $p < 0.05$; *** $p < 0.001$. WTP, willingness to pay; NTD, new Taiwan dollar (1 NTD = 0.033 USD = 0.028 Euros).

4. Discussion

The above analysis shows that tourists and local residents have great differences in their preferences for land use. Tourists hope to reduce land use and development, whereas residents hope for changes in land patterns. Further analysis showed that people who prefer increasing land use belong to groups with lower or higher income levels. Presumably, they want to increase their profits by developing and investing in land patterns.

Previous studies have indicated that residents' support for tourism development is affected by local economic conditions, economic benefits for residents, environmental attitudes, and tourism resources [71–73]. Dodds and Holmes [74] pointed out the differences in environmental conservation attitudes between residents and tourists, which varied according to sex, age, educational level. Robledano et al. [75] pointed out that tourists believed that attributes such as natural landscape, biodiversity, and environmental education are important aspects of the lagoon ecosystem. Stefánica and Butnaru [76] argued that responsibility for the environmental impacts of tourism development—which include the destruction of biodiversity, pollution, global warming, increased waste, and natural resource depletion—should be shared by tourism industry operators and tourists alike.

Considering the differences between tourists' and residents' preferences, this study formulated three assessment schemes based on the six attributes and levels of Green Island's ecosystem services (Table 7): the Environmental Protection Scheme, Recreational Development Scheme, and Integrated Operation and Management Scheme. The Environmental Protection Scheme is based on the attributes of increasing the natural landscape coverage area, increasing biodiversity, and maintaining the ecological security level. The Recreational Development Scheme is based on the attributes of increasing the land use, ecotourism mode, and improving the level of ecological security. The Integrated Operation and Management Scheme is based on the environmental protection and recreational guide, combined with the formulation of the social system. This scheme includes four attributes and levels: increasing the natural landscape coverage area, increasing biodiversity, ecotourism mode, and improving the level of ecological security. Our analysis found that the benefit brought by the Environmental Protection Scheme was 7641 NTD/person/yr. The figures for the Recreational Development Scheme and Integrated Operation and Management Scheme were 6684 NTD/person/yr and 8838 NTD/person/yr, respectively.

Table 7. WTP for each Green Island ecosystem service management scheme.

Policy Attributes	Environmental Protection	Recreation Development	Integrated Operation and Management
Land-use pattern	Maintain status quo	Increase land use	Maintain status quo
Natural landscape coverage	Increase coverage	Maintain status quo	Increase coverage
Biodiversity	Increase biodiversity	Maintain status quo	Increase biodiversity
Ecotourism model	Maintain status quo	Implement environmental education	Implement environmental education
Ecological security level	Improve security level	Improve security level	Improve security level
WTP ¹ (NTD/person/yr)	7641	6684	8838

¹ WTP, willingness to pay; NTD, new Taiwan dollar (1 NTD = 0.033 USD = 0.028 Euros).

It is clear that the best combination for respondents is to increase natural landscape coverage, increase the species recovery plan, conduct environmental education programs, and secure the status of the ecological security level. These results can help inform future management strategies for eco-environmental impact reduction programs on Green Island.

5. Conclusions

Sustainable island tourism development requires the integration of recreation, environment, and management information, which is further considered in the decision making for the development and management of sustainable tourism operations. This study used CE to construct a random utility model for Green Island ecosystem services in Taiwan. To do so, it incorporated various factors into the evaluation model for validation, such as recreation (e.g., ecotourism), environment (e.g., land-use pattern, natural landscape coverage, biodiversity, ecological security), and economic considerations (e.g., ecosystem conservation trust fund).

This study found differences between tourists' and local residents' preferences for ecosystem services. Additionally, in terms of the ecological security attribute, tourists and local residents were willing to make improvements and increase maintenance, and people with high educational levels and incomes showed significantly more willingness than others. We further explored the utility function values of attributes and constructed three hypothetical scenarios for future management to analyze respondents' WTP under different management schemes. To provide a more accurate basis for decision making, we suggested that more consideration should be given to local residents' social views and economic factors before policies and measures are promoted by the policy makers [77].

If Green Island were to implement a pricing system, the economic benefits from the aforementioned programs could be combined with the corresponding operation and management costs, and improvements to service packages and measures could be included. This could be used to plan specific content for Green Island tourism development, which, in turn, could be used as a reference for determining the costs of island tourism packages. Lastly, management units and tour operators should seek to understand tourists' preferences and attitudes in order to propose further operation and management strategies that conform to the concept of island tourism and have more specific and feasible market positioning strategies. This would benefit the sustainable development of tourism on Green Island.

This study has several limitations. If the scope of the study can be expanded in the future, the research framework will be more comprehensive. In view of the conclusions and limitations of this study, we put forward the suggestions outlined below.

This study included only set six environmental resource attributes. However, many other attributes could be included, such as recreational facility maintenance, recreational environment maintenance, and recreational population restrictions. In this way, tourists' and local residents' preferences for environmental attributes could be better understood.

The questionnaire was distributed by random sampling. In this study, the socioeconomic backgrounds of the interviewees were examined only with respect to sex, educational level, age, and the data obtained. Our sample had an insufficient number of individuals from different groups to represent the overall perceptions of those groups. Whether different types of interviewees have different preferences for environmental resource protection should be further explored. Other survey items could also be added in future studies, such as attitudes toward environmental protection and type of tourism (e.g., historical sites, natural landscapes, local art).

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Article

A Strategic Approach to Sustainable Tourism Development Using the A'WOT Hybrid Method: A Case Study of Zonguldak, Turkey

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Abstract: Nowadays, tourism-led economic growth has become a major outcome of the public policy. Researchers have recently begun to address the development of tourism from a perspective that is based on economic, cultural, social, and environmental sustainability. This paper aims at presenting a strategic approach that can help to develop sustainable tourism at touristic destinations. In order to pursue our aim, the A'WOT (AHP-SWOT) hybrid method, developed in combination with SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis and the AHP (Analytic Hierarchy Process) method, was used. SWOT analysis was used to determine the significant strategic factors, and the AHP method was applied to prioritize these factors. The province of Zonguldak, located in Northwest Turkey, was chosen as the research area to suggest tourism strategies that can be sustainably by means of the application of the A'WOT method. Proposed strategies for the research area are related to product diversification and event management, the image of the destination, a sustainable visitor management system, promotion and branding strategies, partnerships, and cooperation. The results illustrate that the dependent economic structure may be broken down with the development of the tourism industry and, therefore, that some strategic initiatives are required to achieve sustainable tourism in the province.

Keywords: sustainable tourism; strategic planning; A'WOT; TOWS matrix

1. Introduction

As the impact of sustainable development on the world's future is better understood, each industry is encouraged to find a solution for sustainability in its own field. Sustainability puts its "attention on a set of ethical values and principles, which guides action in a responsible and harmonious way, incorporating the environmental and societal consequences of actions, as well as economic goals" [1]. The prefix 'sustainable' is currently being used in various fields, such as tourism, architecture, agriculture, and the development of communities [2]. Thus, sustainability has become one of the most important strategic issues for many industries [3]. For example, the tourism industry, which is one of the world's fastest-growing industries, is now trying to move towards sustainable and responsible practices [4]. Besides this, tourism, which is regarded as an indispensable industry for both economic and social development, may have a positive effect on employment, gross revenue, and production. On the other hand, it may have negative effects on the environment [5]. If tourism is not planned and managed properly, it may cause permanent damage to the physical, social, cultural, and economic environment of a tourist destination [6]. That is why it is important to focus on sustainable tourism as a significant issue. Such reasons as disruption of the ecological balance due to global warming, the loss of social values, and the failure to preserve natural, historical, social, and cultural assets make sustainable tourism a necessity [7].

However, in order to achieve a more sustainable form of tourism, there is a need for a more holistic perspective that allows us to consider all of the sectors and resources upon which tourism relies [8]. Furthermore, sustainable tourism has a wide variety of definitions. For instance, sustainable tourism can be defined as “tourism that takes full account of its current and future economic, social, and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities” [9] (p. 12). In this way, sustainable tourism should ensure an optimal use of environmental resources, respect the socio-cultural characteristics of the local communities, and yet provide socio-economic utility to stakeholders [9]. Similarly, Müller [10] (p. 132) outlined that the objective of sustainable tourism is “to influence economic health, subjective well-being of the locals, unspoiled nature, protection of the resources, healthy culture, and optimum satisfaction of guest requirements”. Another definition of sustainable tourism is the one provided by Hunter [11] (p. 851), who defined sustainable tourism as “an adaptive paradigm which legitimizes a variety of approaches according to specific circumstances”. According to Niedziolka [12] (p. 160), sustainable tourism is “all forms of activities, management, and development of tourism that preserve natural, economic, and social integrity and guarantee maintenance of natural and cultural resources”. The majority of these definitions emphasize that people are responsible for respecting and preserving the economic, environmental, and socio-cultural balances [13–16].

For many years, the sustainable management of tourism has been a challenge for residents and tourists. There has been a radical change in the tourism perceptions of local people, and mass tourism has become a local political issue [17]. This can also be noticed in the emergence of the terms tourism-phobia and overtourism, which have developed from the growing evolution of unsustainable mass-tourism practices. Tourism-phobia describes the social discontentment that has arisen in response to the pressure of tourism [18]. Overtourism is defined by the United Nations World Tourism Organization (UNWTO) [19] (p. 4) as the impact of tourism on a destination that excessively influences the perceived quality of life of the citizens as well as the quality of the visitors’ experiences in a negative way. If measures are not taken in terms of sustainability in tourism, environmental problems will be encountered and this will negatively affect both the local population and the number of tourists. In sum, UNWTO [19] (p. 3) states that “tourism will only be sustainable if developed and managed considering both visitors and local communities”. As can be seen, the protection of natural, historical, and cultural resources and long-term sustainability in tourism are becoming important for all countries. Therefore, a systematic approach is needed in the design of sustainable tourism development planning.

The main purpose of this study is to present a strategic approach that can contribute to the sustainability of tourism at touristic destinations. In order to achieve this purpose, the A’WOT (AHP-SWOT) hybrid method was used in this study. The province of Zonguldak in the West Black Sea Region of Turkey was chosen as a case study. Hence, the sub-purpose of this study is to propose sustainable tourism strategies for Zonguldak using the A’WOT method. To achieve this sub-purpose, both the internal and external factors affecting the tourism industry in Zonguldak were determined in advance, and the priorities of these factors were also calculated. The strategy proposals for sustainable tourism in Zonguldak were formulated by using the TOWS (Threats, Opportunities, Weaknesses, Strengths) matrix together with the region-specific vision statement and the main sustainable tourism goals. The outcome may also have implications for the implementation of future policy for the stakeholders in the region. Moreover, the findings within this study may also be applicable to other destinations where sustainable tourism can be developed.

2. Literature Review

Numerous authors have discussed sustainable tourism as a topic [20–22]. However, a relatively lower number of studies have focused on the development of strategies for sustainable tourism. It will be useful to provide a brief review of the literature on sustainable tourism development strategies from the standpoint of the purpose of this study.

Different regions have been subject to studies related to sustainable tourism development strategies. Using the benchmarking method, Helmy [23] evaluated the Egyptian tourist planning mechanism from the sustainability perspective. He demonstrated that the tourist planning system lacks sustainable tourism development programmes and more cooperative efforts were necessary for the Egyptian tourist planning mechanism in order to achieve sustainability in tourism. Font and Serra [24] improved sustainable tourism marketing strategies in Barcelona. They emphasized the criteria of sustainability, such as minimizing the negative environmental and social impacts, reducing the carbon footprint of transport, normalizing the behavior of the visitors, reducing touristic overcrowding, compensating for the negative impacts caused by tourism, serving the destination, and serving the needs of the city. Grytsiuk et al. [25] built a strategy for the sustainable development of tourism in the Carpathian region of Ukraine under the conditions brought about by modern global changes. The basis of the sustainable development tourism strategy was to enhance the life quality of the inhabitants of the Carpathians. They also emphasized the formulation of an organizational development management mechanism of tourist destinations and the construction of an effective model of cooperation between government, business, and society. Another example is the one offered by Cortez [26], who presented the strategies that were adopted by the Government of the State of Bolivia to improve sustainable tourism. She highlighted that sustainable tourism development was linked to the community's self-actualization and requires planning. Mondal [27] determined that the present tourism activities in Bangladesh are unsustainable and analyzed a way to attain a sustainable tourism industry in Bangladesh using the Strengths, Weaknesses, Opportunities, Threats (SWOT) analysis and a TOWS matrix. To develop a sustainable tourism industry, he suggested several strategies, such as ensuring the security of tourists, planning for sustainable economic profits, more environmental regulations, notifying people about sustainable tourism, and the development of the required infrastructure. He also implied that the findings of the study would help tourism stakeholders to analyze present problems of tourism. Feili et al. [28] used the SWOT approach and fuzzy logic to find sustainable tourism development strategies in Iran. Their strategies included planning the progress of transportation in the region, informing people about tourism developers' activities in the media, providing accommodation for overnight and long stays, using professional managers in various tourist places, and implementing plans related to ecotourism. Rezapouraghdam and Esmaeili [29] evaluated SWOT for sustainable desert-tourism development in Khara Desert, Iran. They tried to provide a holistic sustainable strategic planning methodology for tourism authorities and practitioners in Iran. They concluded that if desert-tourism drew enough attention from tourism authorities, it would be seen as having a great potential for contributing to the economy, the prosperity, and the sustainable development of the environmental societies in Iran. They stressed that the most important step to be taken was to prepare a sustainable management master plan for the region. Sulistyadi et al. [30] used the SWOT analysis and a quantitative strategic planning matrix to build a sustainable tourism development model in their study and applied this model to the Thousand Islands Tourism Area, Jakarta. As a result, they summarized their tourism development strategies as strengthening the commitment of the stakeholder, increasing the role and capabilities of the local communities, re-enforcing the principles of sustainable tourism, and developing responsible tourism marketing. They also highlighted that the role of destination management organizations leads the applied tourism development strategy model.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) [31] is also counted among the institutions that use SWOT in order to present sustainable tourism strategies for better management and long-term planning on core issues in Bali, Indonesia. The resulting strategy included a shared vision, strategic objectives, and an action plan to be implemented by stakeholders. Paunovic and Jovanovic [32] mentioned in their study that sustainable tourism was based on a holistic approach and a knowledge-based platform; thereby, all forms and approaches of tourism should be considered. They suggested a holistic approach for improving sustainable mountain tourism and collected the data through interviews with individuals for the development of sustainable tourism

in the German Alps. Indicators of sustainable tourism, cross-border cooperation, and stakeholder participation emerged as important themes for the practice of sustainable tourism. Stoddard et al. [33] suggested that tourism development organizations should adopt a triple-bottom-line framework, which includes economic, environmental, and social sustainability strategies to enhance sustainability. They pointed out that the triple-bottom-line framework could improve the strategic decision-making of tourism development organizations. Neto [34] focused on giving higher priority to the participation of the community and the reduction of poverty in developing countries for the development of sustainable tourism. According to him, the emphasis should be placed on a pro-poor tourism approach all over the world. He determined four major policy recommendations that could contribute to the expansion of the pro-poor tourism approach in developing countries. These policies were poverty alleviation at the center of national strategies, more opportunities for the poor to make use of tourism benefits and partnerships, and role of the international community. Reichel and Uriely [35] presented a conceptual strategic approach for sustainable tourism development in the Israeli Negev Desert. This approach was based on the assumption that developments in tourist demand associated with postmodern tourism are persistent. They combined cultural heritage and nature-oriented themes with simulated attractions in their study. Nowacki et al. [36] evaluated tourism development strategies in Poland, pointing towards strategic planning, the involvement of the stakeholders within the process, and sustainable development principles. They signified that there were real problems with implementing the principles of sustainable tourism in Poland and these policies must put into practice. Besides this, they emphasized that sustainable development must be understood by all stakeholders. To develop sustainable tourism in the Cameron Highlands of Malaysia, Aminu et al. [37] presented an approach based on the Analytic Network Process (ANP) and a Geographic Information System (GIS). They have demonstrated that the integration of ANP and GIS is useful in that it provides analytical tools for spatial planning with regards to sustainable tourism. Tsaur and Wang [38] evaluated sustainable tourism development using the Analytic Hierarchy Process (AHP) and Fuzzy Set Theory and illustrated how it could be implemented in the Green Island in Taiwan. These authors highlighted that the development of tourism could be beneficial for the economy but harmful for the environment and, therefore, a well-designed plan for tourism development was necessary. They also pointed out that tourism authorities have to pay more attention to the protection of the environment and tourism business has to be operated with an ecological consideration.

Several authors have specifically sought to develop sustainable tourism strategies for national parks. For example, Goodwin [39] explored the opportunities for local economic development through tourism at the Komodo, Keoladeo, Gonarezhou, and Puerto Princesa National Parks, and concluded his study with a list of actions. These actions were related to non-capital-intensive enterprises, tourism based on local skills and technology, enclave practices, partnerships between public and private sectors, institutions, and revenue-sharing policies. Cottrell and Cutumisu [40] focused on the analysis of two national parks in Sweden and Romania and examined planning authority and other tourism stakeholders' perceptions of a sustainable tourism development strategy with in-depth interviews. Candrea and Bouriaud [41] assessed the benefits of and threats to sustainable tourism development in Romania's Piatra Craiului National Park using a stakeholder analysis. They identified the main challenges that tourism brings to the protected area in Piatra Craiului via interviews with local stakeholders and revealed the necessity of implementing sustainable tourism strategies in this park. The ecotourism practice was identified as the best solution to solve the problem of sustainable tourism development in this park. The authors also recommended three main policies for sustainable tourism: systematic planning, a private–public partnership, and local authorities and protected area administration. Garcia-Melon et al. [42] proposed strategies with regard to the local, social, and natural environment for the coastal national parks of Venezuela using the ANP technique to help managers make decisions about the sustainability of national parks by taking experts' and stakeholders' opinions into account. They stressed that ANP was a suitable tool for assessing sustainable tourism development strategies. Reihanian et al. [43] addressed the question of whether the current tourism activities in

the Boujagh National Park of Iran comply with the sustainability requirements or not. They used SWOT analysis and a TOWS matrix to identify the required management strategies so as to develop the tourism in the park.

The literature section includes sustainable tourism strategies that have been developed in different regions and national parks by making use of a variety of techniques and approaches, such as SWOT, the ANP, a GIS, the AHP, fuzzy logic, benchmarking, a quantitative strategic planning matrix, a TOWS matrix, and interviews. In these studies, sustainable tourism strategies can be generally categorized into three groups: economic, social, and environmental. Some authors have made attempts to evaluate present tourism planning of the regions and have suggested new strategies for a sustainable form of tourism. In addition to developing a strategy, several authors have also emphasized the significant role of stakeholders and experts in the development of sustainable tourism and the necessity of a systematic planning or a holistic approach.

In this study, a strategic approach for sustainable tourism development is presented by means of an integration of SWOT analysis and the AHP method to help managers make decisions about regional sustainable tourism. The province of Zonguldak, which is located in the West Black Sea Region of Turkey, is discussed as a destination area. In this context, SWOT factors were first determined through expert opinions. After that, these factors were prioritized via the AHP method. Finally, regional sustainable tourism development strategies are presented by means of the TOWS matrix in accordance with the region-specific vision statement and the main sustainable tourism goals.

3. Materials and Methods

3.1. The Research Area

Turkey, which has a high potential for tourism development and offers different types of tourism, is among the top 10 countries in international tourist arrivals and among the top 17 countries in international tourism receipts [44]. However, as a result of mass-tourism activities in Turkey, we face a mass concentration at Mediterranean and Aegean coastal areas, a distorted urban development, a lack of infrastructure, and also environmental problems [45]. In addition, the rapid growth of the tourism industry has transformed tourism trends and policies. The current trends in tourism show that tourists seek more interaction, more exploration of other cultures, more experience, more emotional connections, and more authenticity [46]. Turkey has various natural, cultural, and historical resources, and it is known as a major center of attraction for foreign tourists. In recent years, Turkey has shifted to special interest types of tourism by adopting a sustainable approach to tourism and by distributing tourism activities throughout the year. In particular, the West Black Sea Region of Turkey is suitable for the development of special interest tourism. The climate and nature of the West Black Sea Region will also increase the preference rate of the region in the future. The coasts of this region make it suitable for coastal tourism, and its forests, plateaus, caves, canyons, and waterfalls make it appropriate for ecotourism. Additionally, it is also suitable for cultural tourism thanks to its ancient cities (Filyos Tios, Karabuk-Hadrianapolis, etc.), its examples of civil architecture (Safranbolu houses, Bartın houses, etc.), and its cultural items and local values (Devrek walking sticks, wire breaking, etc.) [47].

In this study, the province of Zonguldak, located in the West Black Sea region of Turkey, was chosen as the research area. This decision was influenced by the fact that the preferences of tourists for special interest tourism will increase the demand for tourism in this region. Moreover, improper tourism policy practices can damage natural and cultural resources. Given the density of tourism activities throughout Turkey, the city of Zonguldak is among the cities that have not attracted the attention of natural tourism planners and tourism organizations so far. Zonguldak also offers a wide range of natural formations, such as caves, forests, and mountain pastures, which have not been considered for tourism activities yet. Within the 2014–2023 vision of the West Black Sea Region Plan [48], Zonguldak has been considered “to be a region that has broken the dependent economic structure and improved the quality of life”. The three main principles for achieving this vision are multi-sectoralism,

participation, and sustainable development, and the two main axes for development are “sustainable social development” and “sectoral diversity supported by innovation and entrepreneurship”. This raises the following questions for the research area: Is it possible to evaluate the tourism industry in terms of sectoral diversity? What is the current status of the tourism industry? What are the most important internal and external factors affecting the tourism industry? Which strategies can be developed for sustainable tourism? The case study tries to find answers to these questions. The region is well-known for being rich in hard coal, its underground resources, and its iron and steel industry. Although the industrial activities in the region are still predominantly based on the mining and iron and steel industries, the employment rates have begun to decline due to the difficulties experienced in mining. This has made unemployment the biggest problem of the region, and the cause of unemployment is mainly the failure to achieve sectoral diversity. That is why it is of vital importance to change the economic structure in the region, of which development currently rests on the mining, iron, and steel industries. It is also crucial to create new employment areas in other sectors that are starting to take off within the region. The sectors that can play a critical role in the economic and social development of the region are machinery manufacturing, the ship industry, the auto supplier industry, and the tourism industry [48]. The region has the potential to be an important tourist attraction, especially in terms of special interest tourism types. Within the scope of the West Black Sea Corridor project, which was presented by the Ministry of Culture and Tourism [45], the diversification and development of tourism was established as the priority area [48]. This decision can be implemented in the province of Zonguldak by considering the following elements.

In the region, the demographic characteristics of the urban and rural areas are very close to each other. In 2018, the population of Zonguldak was 599,698, of which 49.58% are male and 50.42% are female [49]. Fifty-two percent (52%) of Zonguldak is covered with forests and it is rich in natural attractions, which provide its inhabitants with the opportunity for hunting. The coastline and beaches along the Black Sea, the caves, and the flora, which remain green throughout the year, can also be counted among the natural resources of the province. There are plenty of places in Zonguldak with great potential for trekking, photo safaris, angling, and hunting activities. Besides this, Zonguldak is one of the leading cities in Turkey for cave formations, and nearly all of the caves in Zonguldak are open to the public. In addition, mining, weaving, embroidery, and woodworking are region-specific activities [50]. The city is well-known for coal mining, since it has the country’s largest coal reserves. In this context, the Zonguldak Mining Museum, the first mining museum in Turkey, has been exhibiting the tools and materials that are used in mining activities. The region is particularly rich in terms of natural tourism resources, and there are several tourism types in Zonguldak that can still be developed, such as tableland tourism, botanical tourism, butterfly observing, cycling tourism, trekking, rafting, cave tourism, and cultural tourism [51]. Zonguldak has been known as an industrial city since the first years of the Republic, with tourism largely overlooked until now. It is believed that the reason why tourism is ignored not a lack of potential, but rather a lack of entrepreneurship, infrastructure, and services [48].

3.2. Methods

In this study, the A’WOT method and a TOWS matrix were employed to suggest sustainable tourism strategies for the tourism industry in Zonguldak province, Turkey. The key strategic factors were determined by means of SWOT analysis; the decision hierarchy was built through the AHP; the priorities of SWOT factors and groups were calculated via AHP; and the strategies were developed using a TOWS matrix by integrating the region-specific vision statement and the main sustainable tourism goals. The flow diagram of the method is shown as in Figure 1.

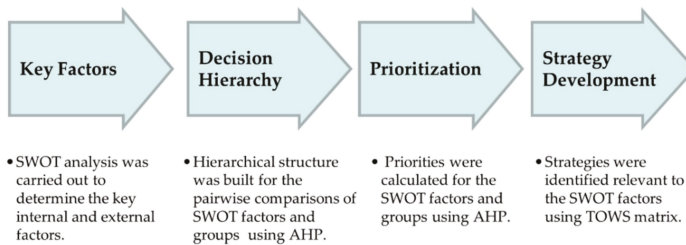


Figure 1. The flow diagram of the applied method. SWOT, Strengths, Weaknesses, Opportunities, Threats; AHP, Analytic Hierarchy Process; TOWS, Threats, Opportunities, Weaknesses, Strengths.

3.2.1. The A'WOT Method

The A'WOT method, which combines the AHP and SWOT analysis [52], is an appropriate method for situations of strategic planning. The idea while using a hybrid method is to evaluate SWOT factors and determine their intensities. The steps of the A'WOT method are listed below [53]:

- a SWOT analysis is carried out;
- pair-wise comparisons between SWOT factors are carried out within every SWOT group using AHP;
- pair-wise comparisons are made between the four SWOT groups using AHP; and
- the results are utilized in the strategy formulation and in the evaluation process.

SWOT analysis is also an early stage of the strategic planning process that helps planners define their strategies and make decisions on the allocation of resources in pursuing those strategies. Problem structuring is a significant stage of the strategy formulation. It means that strategic proposals are closely based on the selected factors. In this case, determining internal and external factors is critical. SWOT analysis is “an effective means for analyzing internal and external environments. The analysis involves systematic thinking and comprehensive diagnosis of factors relating to a new product, technology, management, or planning” [54]. SWOT analysis provides us with knowledge regarding the situation and allows us to design procedures that may be deemed necessary for thinking in a strategic way [55]. Hence, it is a significant tool within situation analysis and it can also be used to collect essential strategic information on decision-making from various resources [56]. However, the importance of SWOT factors is not analytically identified and evaluated in conventional SWOT analysis [54,57]. Conventional SWOT analysis only supplies the basic framework for analyzing the decision-making process.

The aim of A'WOT is “to improve the quantitative information basis of strategic planning processes”. To address a prioritization, selection, or evaluation problem, the AHP method, which is the most popular technique for individual and group decision-making, can be utilized. The advantages of using the AHP in the SWOT analysis are the quantitative testing of SWOT factors and the inclusion of decision-making preferences for planning [58]. The AHP enables decision-makers to assign a relative priority to each factor through pair-wise comparison and assists in carrying out the SWOT analysis more analytically [52–54,59]. In the AHP, verbal expressions are given for providing a pair-wise comparison to decision-makers, and the reciprocal matrices are formed by converting linguistic labels into numerical values [60]. After the hierarchical structure is formed, pairwise judgments are assigned based on the nine-point scale shown in Table 1 to determine the relative importance of the factors.

Table 1. Saaty’s scale of relative importance [61].

Intensity of Relative Importance	Definition
1	Equal importance
3	Moderate importance of one over another
5	Essential or strong importance
7	Very strong importance
9	Extreme importance
2, 4, 6, 8	Intermediate values between the two adjacent judgments

The questionnaire, which consists of pairwise judgments, can be applied by face-to-face interviewing to “maximize the response rate and ensure that the AHP component was clearly understood by respondents” [62]. While selecting decision-makers, their knowledge, years of experience, and level of gain in society are important, not the sample size [63]. The notion of a single decision-maker or team approach can be used to solve the problem. The geometric mean is the correct way of averaging data for the team approach [64]. In making judgments, people cannot estimate the values precisely. Thus, the AHP allows for inconsistency [65]. After making all the pair-wise comparisons, the Consistency Ratio (CR) is determined for each comparison matrix. If it does not exceed 0.10, the CR is acceptable and a decision is made based on normalized values [66]. If the consistency ratio is found to exceed the limit, decision-makers should revise the pair-wise comparisons [67]. Finally, AHP represents the relative importance or priorities of the decision elements at each particular level [68,69]. These are utilized in the strategy formulation and in the evaluation process.

The A’WOT method has been widely used by different authors in different areas, such as forestry [52,53,70], agriculture [54], manufacturing [57], education [71], health services [72], energy [73], maritime [74], cultural industry [75], and tourism [76–81]. Kajanus et al. [76] have proposed a pioneering initiative in the field of tourism by means of the application of the A’WOT method. They centered the investigation of the present state of tourism in the regions of Yla-Savo in Finland and Kassel in Germany and suggested that alternative strategies could be defined in the next step of the planning process. Then, the A’WOT method was used to develop strategies for types of tourism, such as rural tourism [77], ecotourism [78,81], cruise tourism [79], and mountain tourism [80]. In this study, the A’WOT method has been used to develop strategies in the field of sustainable tourism.

3.2.2. The TOWS Matrix

The ultimate goal of a strategic planning process is “to develop and adopt a strategy resulting in a good fit between internal and external factors” [52]. After calculating the priorities of SWOT factors with the AHP, strategies can be developed in accordance with information obtained from this comparison. In the strategy development stage, the TOWS matrix, which is generally employed to assist information analysis in the process of systematizing strategic choices [82], can be used for this purpose. At this stage, strategy alternatives are presented taking into account the internal and external factors derived from the SWOT analysis. Table 2 shows the TOWS matrix suggested by Wehrich [83].

Table 2. The TOWS strategic alternatives matrix [83].

	Internal Strengths (S)	Internal Weaknesses (W)
External Opportunities (O)	SO: “Maxi-Maxi” Strategies Strategies that use to strengths to maximize opportunities	WO: “Mini-Maxi” Strategies Strategies that minimize weaknesses by taking advantage of opportunities
External Threats (T)	ST: “Maxi-Mini” Strategies Strategies that use strengths to minimize threats	WT: “Mini-Mini” Strategies Strategies that minimize weakness and avoid threats

SO, strength-opportunity; ST, strength-threats; WO, weaknesses-opportunities; WT, weaknesses-threats.

The TOWS matrix identifies four alternative strategy groups: Strength-Opportunity (SO), Strength-Threats (ST), Weaknesses-Opportunities (WO), and Weaknesses-Threats (WT). These strategies are derived by maximizing the strengths and opportunities as well as minimizing the weaknesses and threats. SO strategies aim at maximizing both strengths and opportunities, while ST strategies are based on the strengths that can deal with threats in the environment. WT strategies are created by minimizing both weaknesses and threats, while WO strategies attempt to minimize the weaknesses and to maximize the opportunities [83].

4. Results and Discussion

4.1. SWOT Analysis of the Tourism Industry in Zonguldak

In this study, the strategy development process in the tourism industry is presented analytically by utilizing the A'WOT hybrid method. The province of Zonguldak in West Black Sea Region of Turkey was selected as the case study and is discussed step-by-step. The first step of the case was to determine expert groups from different backgrounds. The expert groups consisted of managers of tourism and culture organizations, travel agency owners, hotel managers, local managers, and academics. The relevant factors of the internal environment (strengths and weaknesses) and external environment (opportunities and threats) were determined by selected experts working in the tourism industry as shown in Table 3.

Table 3. The SWOT Matrix for the tourism industry in Zonguldak.

Strengths (S)	Weaknesses (W)
<p>S₁. Use of caves for tourism (Gokgol, Cehennemagzi, Inagzi, Sofular, Cayirkoy, etc.)</p> <p>S₂. Many natural beaches (Hisaronu, Turkali, Kapuz, Gobu, Degirmenagzi, Ilikso, etc.)</p> <p>S₃. Historical remains (Eregli Castle, Heracles Palace, Cestepe Fener Tower, Byzantine Water Cistern, Tombs of Krispos, Hagia Sofia Church, Halil Pasa Mansion, etc.)</p> <p>S₄. Fauna and forest areas suitable for hunting tourism</p> <p>S₅. Organization of festivals (Eregli International Ottoman Strawberry and Culture Festival, Devrek Walking Stick and Culture Festival, Filyos Culture, Arts and Maritime Festival, etc.)</p> <p>S₆. Organization of scientific conferences (Coal Congress)</p> <p>S₇. Rafting activities in Devrek District</p>	<p>W₁. Inadequate infrastructure (transportation networks, accommodation, water systems, energy sources, etc.)</p> <p>W₂. A lack of promotional activities about historical, cultural, and natural riches</p> <p>W₃. Not being located on the transition path of road networks</p> <p>W₄. Inadequacy of coordination between institutions and a lack of communication</p> <p>W₅. A lack of traffic direction signs</p> <p>W₆. Recognition of Zonguldak as just a mining town and a lack of awareness about its tourism potential</p>
Opportunities (O)	Threats (T)
<p>O₁. Plateau potential (Buluklu plateau, Bacakli plateau, Aksu plateau etc.)</p> <p>O₂. Places for camping and caravan tourism</p> <p>O₃. Acceleration of restoration of the ruins of the Tios Ancient City of Filyos</p> <p>O₄. Establishment of Zonguldak Mining Museum</p> <p>O₅. Saltukova airport services</p> <p>O₆. Increased demand for local handicrafts and products (Devrek walking sticks, Elpek weaving products, figures made of metals, etc.)</p> <p>O₇. Implementation of the new incentive system</p>	<p>T₁. Environmental pollution</p> <p>T₂. Rapid and unplanned urbanization</p> <p>T₃. High humidity</p> <p>T₄. A lack of private entrepreneurship</p> <p>T₅. The tourism concept being more identified with the Aegean and Mediterranean regions in Turkey</p> <p>T₆. Failure to benefit from long-term coastal tourism because of the negative effects of sea and climatic conditions</p> <p>T₇. A lack of qualified staff due to migration</p>

Source: Constructed by the author.

4.2. Building the Hierarchical Structure

In this step, the decision hierarchy was built for the pair-wise comparisons of SWOT factors and groups. There are three levels in the hierarchical structure (Figure 2). The first level (ultimate goal) is to develop regional sustainable tourism strategies. The second level (criteria) is the SWOT groups, and the third level (sub-criteria) is the SWOT factors.

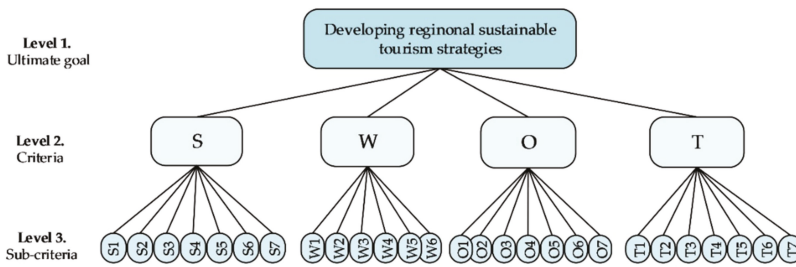


Figure 2. The hierarchical structure of sustainable tourism development for Zonguldak.

4.3. Prioritization of SWOT Factors and Groups

After constructing the decision hierarchy, the importance degrees of SWOT factors and groups were specified by experts. In this step, pair-wise comparisons were made and a questionnaire form consisting of 27 questions was prepared. Experts were interviewed face-to-face, and judgments were taken in the form of paired comparisons on the questionnaire. The questionnaire forms were conducted with experts closely related to the tourism industry in Zonguldak. Experts were selected by considering their expertise and experiences of working in the tourism industry. Ten participants from different backgrounds (one manager of tourism and culture organizations, one travel agency owner, three hotel managers, two local managers from municipal and provincial administrations, and three tourism academics) completed the questionnaire. While the tourism academics had at least a master’s degree, the other participants of the expert group had more than 10 years of experience in their fields. To reach the group consensus, geometric means of expert opinions were used. The geometric means of all responses for each pair-wise comparison were analyzed using the Super Decisions (Version 2.8) software package. Furthermore, the consistency ratio (CR) was calculated for each comparison matrix and was found to be less than 0.10. Priorities of related factors are illustrated in Table 4.

Table 4. The priorities of criteria and subcriteria.

Criteria	Priorities for Level 2	Subcriteria	Priorities for Level 3	Criteria	Priorities for Level 2	Subcriteria	Priorities for Level 3
S	0.25	S ₁	0.4258	W	0.25	W ₁	0.3165
		S ₂	0.0653			W ₂	0.2943
		S ₃	0.0505			W ₃	0.0933
		S ₄	0.1362			W ₄	0.0688
		S ₅	0.0963			W ₅	0.0387
		S ₆	0.1136			W ₆	0.1885
		S ₇	0.1125				
O	0.25	O ₁	0.0510	T	0.25	T ₁	0.2997
		O ₂	0.0469			T ₂	0.1898
		O ₃	0.1837			T ₃	0.0314
		O ₄	0.1350			T ₄	0.1594
		O ₅	0.3183			T ₅	0.0859
		O ₆	0.1146			T ₆	0.1748
		O ₇	0.1504			T ₇	0.0591

According to Table 4, it was determined that the greatest strengths of the province in terms of tourism were the potential for cave tourism (0.4258) and the fauna and forest areas suitable for hunting tourism (0.1362). Zonguldak is known as one of Turkey’s richest regions in terms of cave formations. The region has a rugged topography and is rich in flora, which make it possible for various wild animals to shelter. There are wild animals, including bears, pigs, wolves, foxes, mountain goats, wild ducks, wild pigeons, and partridges, for hunting in the forest areas in the Devrek, Gokcebey, and Eregli districts. Managing the natural heritage values of a region is an important tool in sustainable tourism

planning [84]. In this regard, cave tourism and hunting tourism are vital. While cave tourism improves the social and economic well-being of the local community and the protection of the environment [85], hunting tourism creates a synergy between eco, rural, and sports tourism, and stands out as a special tourism offer based on sustainability [86]. Therefore, these strengths will be among the most effective assets in the development of the sustainable tourism potential of the province.

Moreover, the opportunities of the province will facilitate the development of sustainable tourism on their own. The most important opportunity offered by the environment that should be used is the Saltukova Airport (0.3183). Airports increase the perceived quality in a tourist destination [87] and play a crucial role for the development of tourism. It is expected that Saltukova Airport will contribute to re-enliven tourism activities in the region. The second important opportunity is the restoration the ruins of the Tios Ancient City of Filyos (0.1837). The investigation of the Tios Ancient City, the first and only excavated ancient city on Turkey's Black Sea coast, is of great importance in terms of cultural tourism. As a result of the excavation activity, it is estimated that a large city will be revealed with its roads, forum, baths, religious buildings, houses, storehouses, shops, and graves.

Despite its strengths and opportunities, there are also weaknesses and threats for the province. The most important weakness of the province is its inadequate infrastructure (0.3165). This infrastructure forms an integral part of the tourism package and includes a high number of services, such as transportation networks, accommodation, water systems, and energy resources, which are necessary to meet the needs of tourists [88]. The quality of the infrastructure is an important indicator of the competitiveness and development level of a region in tourism. The second most important weakness is the lack of promotional activities dealing with historical, cultural, and natural riches (0.2943). The promotion of destinations has a great impact on the international tourism market. Image and branding in the tourism industry are regarded as important factors in gaining competitive power. This weakness should be eliminated as soon as possible, since promotion is seen as an effective tool for sustaining the target marketing activities as well as attracting tourists [89].

Environmental pollution (0.2997) and unplanned urbanization (0.1898) are the main environmental threats that can affect the tourism industry. To minimize environmental impacts, the authorities should act within the context of environmental sustainability while implementing activities for tourism development.

4.4. Strategy Development

In the previous studies suggesting sustainable tourism strategies in different regions, several authors used only SWOT analysis to develop sustainable tourism strategies [29,31,43], while others used SWOT analysis along with other methods, such as the TOWS matrix [27], fuzzy logic and the TOWS matrix [28], and a quantitative strategic planning matrix [30]. For example, Aminu et al. [37] and Garcia-Melon et al. [42] proposed sustainable strategies using the ANP technique. Tsaur and Wang [38] proposed an evaluation procedure for sustainable tourism development by the AHP and Fuzzy Set Theory. In this study, a strategic approach for the sustainable tourism development of touristic destinations was presented by means of the application of the A'WOT method and the TOWS matrix in accordance with the region-specific vision statement and main sustainable tourism goals. The region-specific vision statement for a sustainable tourism strategy in Zonguldak province was identified as "to ensure long-term and healthy development of the tourism industry by distributing tourism activities more widely in Zonguldak" based on the Tourism Strategy of Turkey: 2023 Report [45] and on the definition of sustainable tourism [9,10,19] as found in the literature. Accordingly, the main Sustainable Tourism Goals (STGs) for Zonguldak were determined as follows [9,24]:

- STG1. Providing a high-quality experience to visitors
- STG2. Providing economic benefits to host communities
- STG3. Minimizing environmental impacts and protecting the authenticity of the province

To be able to achieve sustainable tourism goals, effective strategies should be developed and implemented in cooperation with all relevant stakeholders, authorities, and institutions. During the development of tourism strategies, priorities of criteria and subcriteria should be taken into account in addition to the vision statement and the main STGs. Strategies related to the sustainable tourism goals need to be evaluated from a holistic perspective to achieve the maximum benefit from sustainable tourism. According to the internal and external factors in the matrix of SWOT, strategy proposals were formulated with experts' guidance by means of the TOWS matrix for sustainable tourism in Zonguldak as shown in Table 5.

Table 5. The strategy formulation using the TOWS matrix.

	STG	Strengths	STG	Weaknesses
Opportunities	STG1-STG2	<p>SO Strategies Support product diversification and event management (S1, S2, S3, S4, S5, S6, S7, O1, O2, O3, O4, O5, O6, O7)</p> <ul style="list-style-type: none"> Guidance of destination management organizations for organizing national and international events Reward best practices within tourism types Promote the development of traditional handicrafts 	STG1-STG3	<p>WO Strategies Enhance the image of destination (W1, W3, W6, O1, O2, O3, O4, O5, O6)</p> <ul style="list-style-type: none"> Determine the thematic routes for the West Black Sea Region and ensure that Zonguldak is included in the tour programs Invest more intensively in the modernization of tourism infrastructure Protection of value-added products and services
		<p>ST Strategies Ensure a sustainable visitor management system that minimizes environmental impacts (S1, S2, S3, S4, S5, S6, S7, T1, T4, T5, T6, T7)</p> <ul style="list-style-type: none"> Distribute tourism activities throughout the year without changing the identity and culture of the city Initiate activities to increase tourism entrepreneurship awareness of the society by considering optimal use of environmental resources Training on sustainable tourism for relevant stakeholders Reduce and recycle waste 		<p>WT Strategies Initiate effective promotion and branding strategies (W2, T5)</p> <ul style="list-style-type: none"> Advertise of destination in the country and abroad
Threats	STG1-STG3	<ul style="list-style-type: none"> Reduce and recycle waste 	STG1-STG2-STG3	<p>Establish partnerships and cooperation (W4, T4)</p> <ul style="list-style-type: none"> Organize permanent programs for a public-private partnership Strengthen linkages between tourism and other regional industrial sectors Empower local authorities in the implementation of sustainable principles

Source: Constructed by the author. STG, sustainable tourism goal.

Support product diversification and event management: The success of sustainable tourism development depends on using policies of diversification and specialization wisely [90]. In addition, event tourism attempts to derive a benefit from events to attract tourists to visit [91]. Therefore, the proposed product diversification and event management programs within the scope of this study could be organized by means of a public-private partnership to provide a high-quality experience to visitors (STG1). Besides this, destination management organizations could be the guide for organizing national and international events. In previous studies, Sulistyadi et al. [30] and Klimek [92] also pointed out the role of destination management organizations in the implementation of sustainable tourism. In the context of the diversity of tourism products, the competitiveness of tourism relies on the sustainable use of resources in natural ecosystems [90]. Hence, in particular, the caves, which are the strongest assets of the city (0.4258), must be protected, be used in a sustainable way, and achieve availability today and in the future. Nevertheless, the suitable fauna and forest areas for hunting tourism (0.1362), rafting activities (0.1125), natural beaches (0.0653), historical remains (0.0505),

the organization of scientific conferences (0.1136), and festivals (0.0963) are the other factors that can be evaluated within the scope of product diversity and event management. Thanks to tourism diversification, seasonality, which has negative environmental, economic, social, and cultural impacts on sustainable tourism destinations, can be prevented [93]. As a result, tourism activities can spread throughout the year by increasing the number of tourist visits during low periods [94]. Thus, a management system that provides for the sustainable use of resources and prevents overtourism in the future will be in operation. Sustainable tourism not only benefits from the visitor but also the maximization of benefits from the host communities [13]. Similarly, Tsaur and Wang [38] also claimed that tourism development could be beneficial for the economy. To provide economic benefits to the host communities (STG2), incentive-based and conscious entrepreneurial approaches should be developed. For instance, best practices within tourism types, such as tableland tourism, botanical tourism, butterfly observing, cycling tourism, trekking, rafting, cave tourism, and cultural tourism, can be rewarded. As special interest tourism types promote more balanced growth in accordance with local environmental and socio-cultural concerns, it is increasingly recognized as the key to sustainable development [95]. In addition to this, handicrafts also affect sustainable tourism development [96]. The increased demand for traditional handicrafts (0.1146) will affect the province in terms of both economic and socio-cultural development.

Enhance the image of the destination: Another topic related to sustainable tourism destinations is the destination's image, which is the main factor in achieving effective marketing for the destination [97]. The inclusion of Zonguldak in tour programs, the modernization of the infrastructure, and the protection of value-added products and services are among the main topics to help enhance the image of the destination and, therefore, to provide a high-quality experience to the visitors (STG1). Tourism infrastructure development activities should be carried out with sustainable environmental management practices that minimize environmental impacts (STG3). This is in line with prior studies, in which Mondal [27] suggested the development of the required infrastructure and more environmental regulation for sustainable tourism. Both the inclusion of Zonguldak in tour programs and tourism infrastructure play an important role in the tourism industry as it affects the level of visitor satisfaction. Moreover, it is known that high-value-added products and services in the tourism sector and sustainable use of natural and cultural resources increase competitiveness [98]. Mining, weaving, embroidery, and woodworking are among the value-added activities of the region. In addition, the establishment of the Zonguldak Mining Museum (0.1350), which is considered to be a part of the cultural heritage, is among the factors that can enhance the image of the destination.

Ensure a sustainable visitor management system that minimizes environmental impacts: One of the ways to ensure sustainable visitor management and provide a high-quality experience to visitors (STG1) is to distribute tourism activities throughout the year. For this purpose, it may be suggested to increase the touristic initiatives and to enrich the touristic experiences with different types of special interest tourism without changing the identity and culture of the city. Tsaur and Wang [38] emphasized that tourism development could be harmful to the environment. The other sustainability practice for tourism development is to minimize environmental impacts [16]. The two most important threats to the province are, as stated above, environmental pollution (0.2997) and rapid, unplanned urbanization (0.1898). To minimize the negative impacts on the environment and protect the authenticity of the province (STG3), the authorities should act within the context of environmental sustainability and promote actions that do not change the identity and culture of the city, while planning and implementing activities for tourism development. At this point, training on sustainable tourism for relevant stakeholders, reducing waste, and encouraging recycling are among the important issues to be considered.

Initiate effective promotion and branding strategies: In the constantly changing tourism market, it has become difficult for a destination to be competitive on the global level [99]. A sustainable tourism marketing strategy can bring a competitive advantage to a touristic destination [100]. The practices for sustainable tourism destinations to support the destination brand and image are based on advertising

the destination in the country and abroad. “A lack of promotional activities” (0.2943) is among the weaknesses of the province. This weakness can be eliminated by developing effective promotion and brand strategies. For example, Grytsiuk et al. [25] and Cortez [26] also suggested promotion strategies for sustainable tourism in their study. These strategies, complementary to other sustainable tourism strategies, will benefit from both the visitors (STG1) and the host communities (STG2).

Establish partnerships and cooperation: Another important dimension for the development of sustainable tourism is related to partnerships and cooperation, which have been seen as an effective way to support initiatives in tourism development [101]. To achieve sustainable tourism goals, stakeholders play a significant role in both strategy evaluation and at an implementation stage. In other studies, Paunovic and Jovanovic [32] and Nowacki et al. [36] also emphasized that the participation of stakeholders must be ensured in the practice of sustainable tourism. Establishing permanent programs for a public–private partnership, strengthening links between tourism and other regional industrial sectors, and strengthening local governments toward the implementation of sustainable principles are the main actions to be taken to ensure cooperation. In their research on sustainable tourism strategies, Goodwin [39] and Candrea and Bouriaud [41] have also proposed partnerships between public and private sectors. Moreover, Grytsiuk et al. [25] pointed out the formation of an effective model of cooperation between government, business, and society. Similarly, Sulistyadi et al. [30] summarized their tourism development strategies as strengthening the commitment of the stakeholder and increasing the role and capabilities of the local communities. Considering the possible strategies developed, it can be inferred that sustainable tourism development requires the participation of all of the relevant stakeholders.

5. Conclusions

The need for the sustainable development of tourism has become a current issue due to the rapid growth of the tourism industry worldwide and the adverse effects of tourism on the social structure, natural resources, and cultural values. As a matter of fact, sustainable tourism allows us to minimize the environmental impact and to maximize the socio-economic advantages of tourist destinations [102]. In other words, sustainability is meant to consider both the development and preservation of the tourism industry [103]. For this reason, tourism activities need to be planned, managed, and monitored carefully using a long-term sustainable approach [104]. In this study, a strategic approach for the sustainable tourism development of destinations was presented by means of the application of the A’WOT method. The primary advantages of this study’s method are to present an integrated perspective that can help in the design of a strategic planning process and to strengthen the quantitative side of strategic planning. The province of Zonguldak, located in the West Black Sea Region of Turkey, was chosen as the research area to propose sustainable tourism strategies. Zonguldak province has the potential to be a suitable destination for the development of special interest tourism types with its cultural richness, forests, plateaus, caves, and natural beauties created by a combination of blue and green colors. Besides this, it can be concluded that, despite its many weaknesses and environmental threats, Zonguldak bears a tourism potential that should be managed in a sustainable way with strategic approaches. It should be considered that, on the one hand, the “support product diversification and event management” strategies proposed in this study would particularly help to develop tourism as an economic diversification tool by breaking the dependent structure of the province. On the other hand, it would “ensure a sustainable visitor management system that minimizes environmental impacts” and “enhance the image of the destination”, which would increase in the number of tourists and indirectly help to solve the problem of overtourism in popular tourist destinations.

These regional strategies, suggested within the framework of an analytical approach, can lead to the design of sustainable tourism development planning. This study contributes to a theoretical approach by reviewing the literature on sustainable tourism development strategies and by reflecting on the current situation of the tourism industry of Zonguldak with the A’WOT method. This method

supports decision-makers in the decision-making process by providing a flow diagram that consists of the basic stages of identifying SWOT factors, establishing a decision hierarchy, prioritizing SWOT factors and groups, and developing a strategy using the TOWS matrix. Thereby, from a practical perspective, it supplies a systematic approach for decision-makers in the implementation of sustainable tourism strategies and the production of feasible solutions for the tourism industry. The use of this step-by-step decision-making process can promote a guiding role for tourism stakeholders, such as national and local government, tourism enterprises, local communities, and educational institutions. The original aspects of this study are the use of the strategic approach, which consists of the A'WOT method, the TOWS matrix, a region-specific vision statement, and the main sustainable tourism goals, in sustainable tourism development and the application of the method in Zonguldak. Furthermore, the analytical structure used in this study can be applied to other similar destinations. This structure can be used in further studies related to sustainability by integrating other multicriteria decision-making methods.

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Article

Agritourism-A Sustainable Development Factor for Improving the ‘Health’ of Rural Settlements. Case Study Apuseni Mountains Area

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Abstract: Agritourism is a complex activity, a chance maybe today to ensure both human health and the “health” of the environment and rural settlements in order to achieve a most wanted desideratum, the sustainability of the rural environment. The idea of this paper starts from the trend of the current period, meaning the strong emphasis on natural, organic, bio, in all human activities, health and environment, in a word, sustainability. The necessity of implementing the sustainability of activities, health and environment in rural areas, taking into account the agritourism field, was a subject pursued in the study, taking as area of study the mountainous rural environment, the reason of this choice deriving from the fact that the mountain area offers great opportunities for agritourism development, the practice of which is even necessary in the current period. The sustainability of agritourism on rural health and environment cannot be dissociated from the economic, social and cultural life of the community in which it manifests itself, and has a multiplier effect on all the domains with which it interacts. So the purpose of the paper is to follow the development of the agritourism field and, based on some present information, to make a future forecast for some specific indicators, to highlight the representative aspects related to the development and capitalization of guesthouses from a rural mountain environment through agritourism and to come up with a forecast for future transformations that need to take place in the studied area in order to support the sustainable development of the human environment through agritourism.

Keywords: agritourism; sustainable development; the “health” of rural settlements; Apuseni mountains; forecast through a logistic model

1. Introduction

Most European countries, and beyond, have to see rural development as a chance to fight poverty, to ensure the sustainability [1,2] of the rural environment, so each industry is encouraged to find a solution for sustainability in its own field [3]. Sustainability puts its accent on values and principles, which have as their main purpose to guide actions, in a responsible and harmonious way, taking into consideration the environmental and societal consequences, as well as economic purposes [4].

Agritourism is an activity that links the economic, social and environmental components of sustainability, strongly related to local communities and their attitudes towards tourism [5], so one of the solutions for rural areas can undoubtedly be agritourism. Agritourism can be seen as an innovative and diversifying strategy for farms, [6] including recreational and leisure activities for tourists, with

many economic and non-economic benefits for farmers, visitors and communities [7], with a significant emphasis on natural, organic, bio aspects, in any part of human activities, health and the environment, in a word on sustainability [8,9]. In practical terms, agritourism is a complex activity, which is directly connected with other local activities [10]. In a rural locality, tourism cannot be dissociated from the economic, social and cultural life of the community in which it manifests itself. In European countries, agritourism has become a priority in the last decades of this century, in local development policies now and in the future, and this type of tourism is being based on three coordinates: space, people and products that are in a close correlation, unable to exist without each other. Agritourism can support new directions in rural sustainable development, with specific effects on the environment, agricultural heritage, or economic growth [11,12].

As a tourism offer, agritourism appeared in Europe around the 1960s. The popularity of rural and mountainous areas, in particular, [13] as a possibility to spend a second holiday [14] has increased in most countries [14]. Therefore, in European countries agritourism is not a new phenomenon, what is new is the expansion of it in recent years justified by concerns related to a high quality of life, and of course sustainability. Every offer of agritourism varies in Europe. The real agritourism offer is relatively rare, [11,15] so there are countries with specific agritourism offer (such as Italy, Austria, Switzerland, Germany, Denmark, Spain, the Netherlands, Belgium), or with a mixed offer of rural tourism and agritourism (France, Ireland, Portugal).

As mentioned, the notion “sustainable” is used in various fields, agritourism being one, so sustainability has become one of the most important strategic issues for many rural areas. [3] Most studies have shown that tourism combined with rural resources and traditional products would be an important “tool” for revitalizing rural, mountainous areas [16–22]. Modern patterns of rural development highlight that a rational and planned exploitation of agricultural resources together with the valorization of cultural and naturalistic heritage of rural areas, or simply said, the right leverage to assure sustainable growth of rural settlements, are through agritourism [23].

In fact, the connection between agritourism and sustainability is very well identified in the Italian National Law, [24] in which the eight sustainable objectives of agritourism to support rural area are mentioned: stop rural outmigration by keeping farmers on the land, improving the use of both natural and built rural resources; enhancement of environmental conservation and management; promotion of “typical” rural products; support for rural traditions and cultural initiatives; development of agricultural areas; development of youth and social tourism; and enhancement of the relationship between city and countryside [25].

The idea of sustainable development through agritourism activity in the Apuseni Mountains area is supported by the high potential for tourism activities, (the degree of urbanization is below 30%, meaning large areas that are still rural), and we consider it to be one of the viable solutions for this area. Other studies are based on this statement, studies which reveal the fact that the little settlements here are in decline in the face of limited employment opportunities and poor services, and very important for the “health” of this area is the emphasis on private farming and the expansion of some new activities that are attractive to young people, such as agritourism [17,22].

Literature Review

The sustainability of agritourism on the “health” of rural environment derives from the fact that this activity cannot be dissociated from the economic, social and cultural life of the community. Between tourism and environment there is a close relationship based on: the environmental elements considered to be tourist attractions; facilities and tourism infrastructure; and the impacts generated by tourism development and tourist use on the environment and settlements [26]. The link between agritourism and the sustainability of rural settlements derives from the definition of this activity. Agritourism (see Table 1) is as a form of rural tourism [13] a hospitality activity, performed by agricultural entrepreneurs and their families, that first of all, must remain connected to farming activities (which involves production activities, activities of processing agricultural products in the

household and their marketing), [24], and complementary to developing tourism activities, that completes the income from agricultural activity [27]. We conclude that there is a sustainable activity for agricultural activities and for stopping migration.

Table 1. Agritourism as a tourism offer.

Criteria for Defining Agritourism	The Elements of Definition	Benefits for Those Involved in Developing this Activity
Definition of agritourism from the perspective of agricultural activity	unites elements of two complex sectors—agriculture and tourism can play a significant role in supporting many agricultural enterprises	Advantages for farmers (1) development of new market niches (2) increasing interest for agricultural local products (3) the opportunity to maintain/use agricultural land (4) creating jobs at the family level (5) increasing the sustainability of agricultural businesses
Definition of agritourism from the perspective of the development of rural communities	source of the growth and diversification of the rural economy diversification to maintain the viability of agricultural businesses	Benefits for communities (6) creating new jobs (7) expansion of local market (8) attracting other businesses and small industries
Defining agritourism as a stand-alone component	economic activity within an agricultural holding/farm or food industry enterprise carried out in order to produce visitors' advantages and satisfaction carried out in order to generate additional income for the farmer	Benefits for tourism industry (9) diversifying the mix of tourist products (10) positioning, as a rarity, of agritourism communities

Source: Authors' processing by various bibliographic sources (processing after 7,9,13,27,28).

Therefore, agritourism implies the existence of two main activities: agricultural and tourism activities, which assume three elements specific to any tourist product with some particularities in this case: accommodation, food and entertainment [28], and of these peculiarities of the tourist product rural settlements may have a chance to win:

- The first element of the agritourism product is accommodation. The farmer has the possibility to obtain additional income from renting the surplus of rooms existing in the farm. The agritourism accommodation service is thus intertwined with the main activity of the farmer (agriculture), but without interfering with it.
- The second element of the agritourism product is food. Through food, the farmer has the possibility of direct capitalization of agricultural production, being a direct relationship between the person who offers the services (the farmer and his family) and the one who requests them (the tourist). Another peculiarity of food in agritourism is the fact that it is based on the traditional cuisine of the place and prepared with products from their own household, or from the area/region, thus supporting both the agritourism farm and the area it is part of.
- The third element of the agritourism product is tourist entertainment. In the case of agritourism, the tourist entertainment is based on traditional activities in the farm or household where the tourist can actively or passively participate.

The preservation of a rural world, with everything that is significant, can take into account the initiation and development of this form of tourism. The meeting between the rural area, a particularly fragile environment, and the dynamism imposed by the tourism phenomenon poses the risk of restructuring. However, agritourism must become an alternative to the problems of rural settlement, so in this context it may take three forms (see Figure 1).

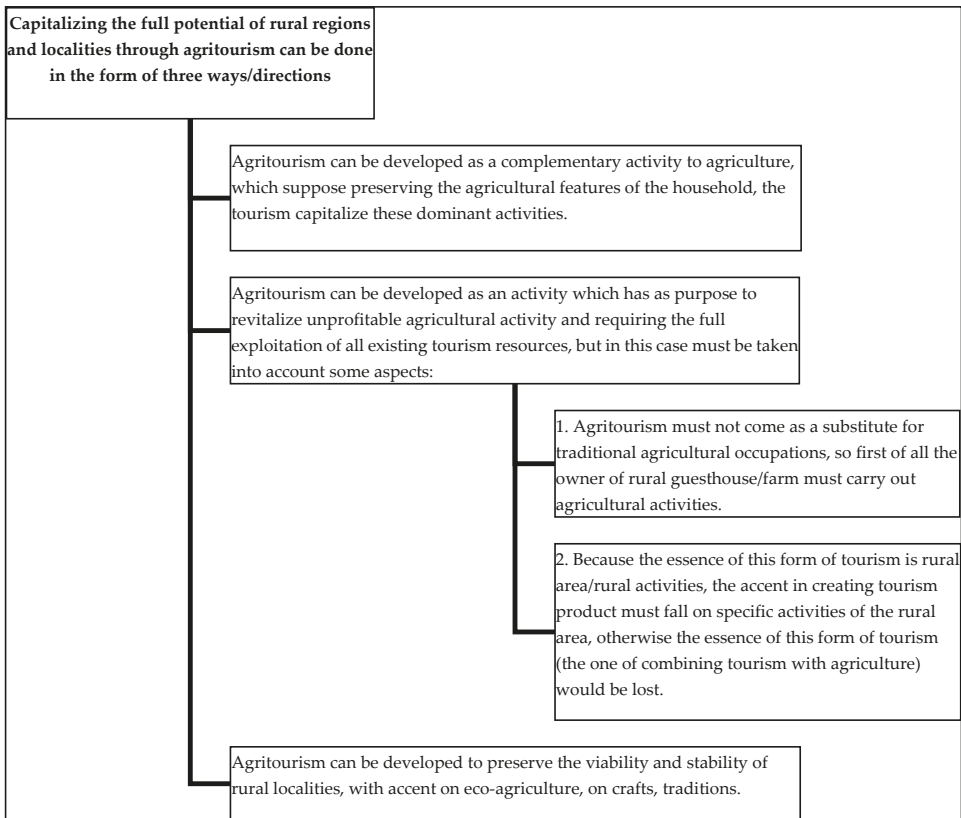


Figure 1. Capitalizing the full potential of rural regions and localities through agritourism (processing after 6,9,10,14,27).

The impact of agritourism on quality of life standards is significant in terms of profit, in many ways, [29], so the rural areas where agritourism will be practiced will become the places where all elements of local sustainable development will be assembled [5,30]. There will appear an interest in improving the infrastructure, of creating a spiritual life of rural localities, strategic objectives may be achieved regarding the human factor, technical endowments and heritage conservation [31–33]. So in order to support these statements, illustrated in Figure 2, we have briefly reviewed some examples of good practices, focusing on community approach and territorial cohesion in rural areas.

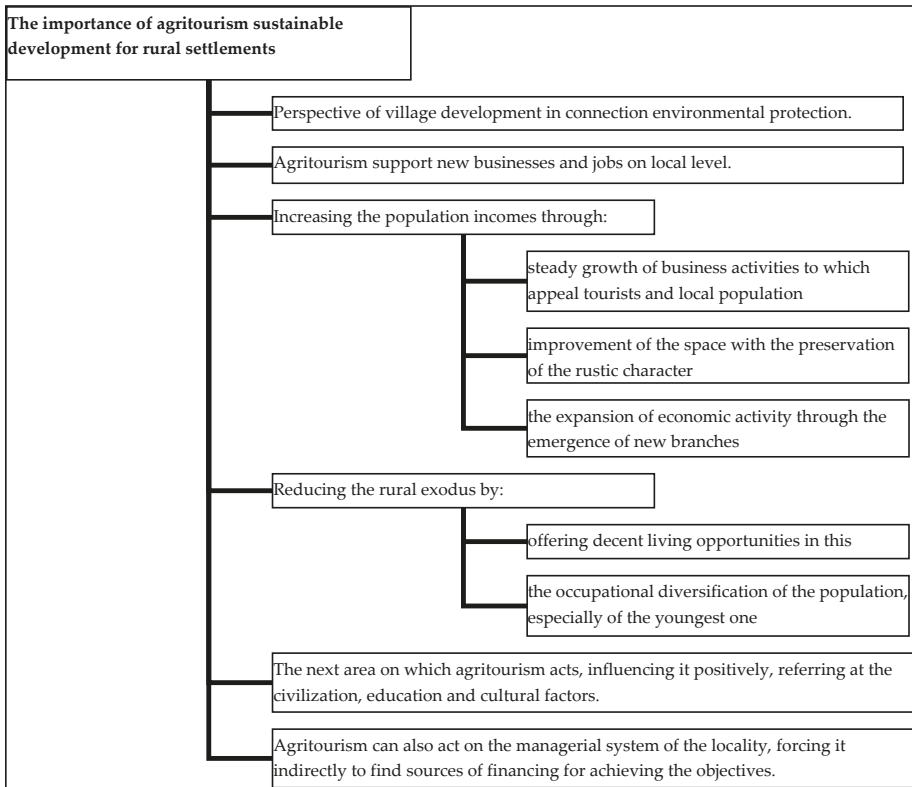


Figure 2. The importance of agritourism sustainable development for rural settlements [5,30–32].

Maintaining agricultural activity is a major challenge for European rural areas. The decline of local economies affects the environment, landscapes and other economic sectors, especially tourism and social life. Agritourism can be a way of diversifying rural economies in rural areas and can provide alternative incomes for the population of these areas, through the quality and authenticity of traditional products, which represent the identity of popular localities, and attract consumers, saturated by the homogeneity of the same products. However, the quality of local products has a special role to play in influencing and securing agritourism [19]. Therefore, the focus should be on strong partnerships, to ensure mixing/blending of cultural activities, cultural heritage, gastronomy, agriculture. There are some practical examples from different countries, where this blending was made possible through some projects in which, through the approach or benefits of the projects, the beneficial consequences mentioned in Figure 2 or others express the link between agritourism and sustainability:

- The Province of Belluno, Italy, has developed a new approach regarding the development of mountainous territory, involving different economic sectors. “Routes to mountain aromas” was a project linking tour operators with local agricultural products from the territory. The tourist package developed includes local agricultural products, the environment and landscapes, crafts and culture, traditions, the aim being to bring together various productive sectors such as farmers, craftsmen, tourists and cultural activities through a multi-sectorial approach, supporting social cohesion by linking territorial tourism activities, encouraging the use of local products [19].
- The “Rural Tourism District” is another innovative project applied in the Valle del Crocchio Local Action Group from Italy. The project demonstrates innovation and forward thinking because it anticipated regional regulation regarding rural districts at a time when no other area had thought

about it. The project itself focuses on community approach and territorial cohesion in rural areas through an integrated package of activities that have developed the quality of infrastructure for agritourism in the region and connects: the tourist accommodation structures with agriculture; local cooperatives; cultural attractions such as museums and architectural sites and recreational activities such as pedestrianized road networks [20].

- The project “Grandmother’s House”, from GA Pomoottoriry LAG, Finland, was the idea of a local who focused on the country’s lifestyle, and the economic and ecological benefits were taken into account, the project being implemented by local authorities in order to capitalize natural and anthropogenic resources in the region and encourage migration in this region, given the economic benefits generated by the growth of housing development. The repopulation of this rural area was one of the priorities of the LAG, at the same time as economic development strategy, coupled with the stimulation of tourism and other service sectors [20].
- “Intelligent Village of the Future (Ruhtinansalmi)” from Finland, in this case, the proposed activity of the project takes place in an active and innovative but isolated village in the northeastern part of Finland. As in many isolated areas of Europe, the village faces a population decline, the effect of an economy based on agriculture that has become unprofitable for the population. This project has been developed to improve the situation of the community as this project proposes the development of infrastructure and services to attract people from all over the world or from other countries to live, work or spend a holiday in the area. The aims of this project were: to provide fast internet in the village; to develop methods of obtaining bio energy; to renovate and equip the adult education center from locality; to develop sites for promoting the area (both in German and English); to test activities such as adventure tourism; to map the properties and to promote them for sale or rent; to place tourist information signs in areas where they do not exist [21].
- The “Spa center on a farm built in 1645” from The Netherlands is another example of community approach and territorial cohesion. One of the features that make this project different is the high level of cooperation with local and regional entrepreneurs for the supply of beverages or food [21].

Agritourism, more than any other field of activity, is dependent on the environment, representing its “raw material”, the object and field of activity and the development of tourism, being its framework support, or the bearer of its resources. Tourism is carried out in the environment, and the environment and its quality can favor or disadvantage tourism activities [34]. Some principles can be mentioned in the case of agritourism in order for it to be sustainable tourism: [35] economic development, social development and environmental protection.

There are also many benefits for the tourists willing to practice this activity (see Table 2).

World Tourism Organization statistics show that forms of tourism in rural area are increasing. Specialists believe that rural communities will be more successful in the future in caring out agritourism activities for several reasons [36]:

- in Europe, the aging population leads to an increase in the number of elderly tourists attracted by this form of tourism;
- to increase interest in environmental and health issues;
- those from urban area have short vacations, so they want destinations that are easy to find and affordable from a financial point of view;
- to increase the number of those who want a quiet tourist area in an unpolluted environment.

Table 2. Possible elements to offer through agritourism to potential tourists.

What Does the Agritourism Consumer Want?	What Can be Offered Through Agritourism?
Quiet	<ul style="list-style-type: none"> - location away from the noise sources - respect for privacy
Healthy food	<ul style="list-style-type: none"> - products obtained in their own household - specific culinary tradition
Relax in an active way	<ul style="list-style-type: none"> - climate of relaxation - alternatives to spending leisure time
Return to nature	<ul style="list-style-type: none"> - location as close as possible to the vegetation areas - knowledge of the area's natural resources
Knowledge of the rural area	<ul style="list-style-type: none"> - access to traditions, folk costumes, customs - practicing specific rural handicrafts, such as weaving, pottery, etc. - participation at some specific local holidays
Environmental refuge	<ul style="list-style-type: none"> - location away from the sources of pollution - biological food
Participation in the life of the rural community	<ul style="list-style-type: none"> - proximity between tourist and host - discussions on rural issues and how to deal with them

Source: Authors' processing by various bibliographic sources [7,8,14,28,30].

2. The Aim of the Paper

This paper has as its purpose to highlight the importance of agritourism for improving the “health” of the environment and rural settlements, through sustainable capitalization of the full potential of rural regions and localities. The first sub-purpose is to explain the meaning and reason why agritourism must become an alternative to the problems of rural area, in order to achieve the main desideratum, the sustainability of this environment, taking in consideration its principles and benefits. The second sub-purpose of the paper is to underline the evolution of the current situation of Romanian agritourism guesthouses and to complete a future forecast by using a logistic model. For the third sub-purpose of the paper we chose the Apuseni Mountains, as a concrete area of research, and here we have applied a questionnaire to reveal aspects related to: the surface of the farm and the existence of specialized training, the development and capitalization of households through agritourism, the motivation of tourists to practice agritourism in the area, the desire for cooperation of the owners of agritourism structures to improve the agritourism product. Based on the statistical information existing for the Apuseni Mountains area, a series of future forecasts were made, using the same logistic model as the national level, and the results obtained support the sustainability of this area of activity for this rural area.

3. Materials and Methods

The methodological approach of this paper involved a combination of “desk research” methods (collecting information from secondary sources, already existing) with the collection of primary information through quantitative studies and discussions (interviews/questionnaires). The main advantage of the research is represented by the series analysis of 8 years, so the data were analyzed for a recent and relevant period for agritourism development, as well as the analysis of a representative

tourist area (7% of the country's surface). Specifically, the main activities specific to the research carried out in this study are:

- Office research (identifying and evaluating the information sources, collecting and analyzing secondary information, preparing the theoretical framework).
- Foundation and achievement of some quantitative research (interviews/questionnaires for accommodation spaces from the Apuseni Mountains), centralization, analysis and interpretation of data resulting from the two primary researches and inclusion of conclusions in the final report.
- The questionnaire used in this paper covered two parts:
- identification of information on the respondents' characteristics and the degree of socio-economic development of the area;
- focus on the agritourism field itself.

The questionnaire was conducted through a face-to-face interview, and was addressed directly to the owners of agritourism structures. In order to achieve the proposed objectives, a questionnaire was designed, and subsequently applied in the six counties constituent of the Apuseni Mountains. Questionnaires were applied to each county, the areas being chosen for their representativeness for agritourism activity, and the number of questionnaires applied being directly correlated with the number of households approved for agritourism.

The dynamics of the number of agritourism guesthouses, meaning the net index using the agritourist accommodation capacity, was studied by using a logistic model $NATE = (1/u + b_0 \cdot b_1^Y)^{-1}$, respectively $IAA = (1/u + b_0 \cdot b_1^Y)^{-1}$, motivated by the fact that such series have a capped evolution. The dynamics of the occupied population in agritourism has been studied as a function of the number of such guesthouses found in the area studied at a particular moment in time using the hyperbola $POA = b_0 + b_1/NATE$.

Statistical calculations were performed using the SPSS system in the case of determining the regression functions and correlation coefficients. For graphical representations Wolfram Alpha or Microsoft Excel applications were used. The notions of tabular calculation were achieved by using Microsoft Excel.

The motivation of choosing the area of the Apuseni Mountains, as area of this study derives from the desire to bring this area into the spotlight. We support the above statement by the fact that the area is part of the category of rural areas with great tourist potential that can offer a wide variety of tourist products to tourists. The surface of the Apuseni Mountains region (see Figure 3) represents 7% of Romania and is extended across six counties: Alba, Arad, Bihor, Cluj, Hunedoara and Salaj. The degree of urbanization is low, about 30%, which is an excellent condition for rural tourism. As a human habitat, the area groups 16 towns, 1253 villages, the characteristic element being the absolute dominance of small villages and towns, namely 348 villages have under 100 inhabitants, of which 42 villages have fewer than 20 people [37].



Figure 3. Apuseni Mountains area, (adapted from [38]).

The tourist areas from Apuseni Mountains are grouped, from geographical point of view, in 15 areas, each having certain specific features, being characterized through certain forms of the tourism that it is possible to develop, taking into consideration the main resources existent in each area: Vadul Crisului area and Crisul Repede area, Meziad area, Padis-Cetatile Ponorului area, Aleul Valley area, Valea Iadului-Stana de Vale area, the karst area of the Vascau-Izbuc Calugari, the area of Baisoara Mountain, Gilau-Tarnita area, Belis-Fantanele area, Ighiu Valley area, Ampoi Valley area, the Codru-Moma mountain area, the depression area of Gurahont-Halmagi, Geoagiu Valley, Aries Valley area.

4. Results

4.1. Agritourism in Romania. Current Situation and Future Forecasts

At Romania’s level, according to the national statistics found in the National Institute of Statistics, [39], there are 2556 agritourism accommodation structures (see Table 3-current situation) with 44,499 accommodation places in year 2017 (a certain evolution being recorded here, from 20,208 places in 2010, and 30,480 places in 2014), concentrated in the areas of Bran-Moeciu, Apuseni, Maramures, Bucovina, and the Danube Delta. The Romanian economy has known numerous changes in the period after 1989 up until today. Also the year 2007, relevant to the integration of Romania into the European Union (EU), represents a distinct point in the study of the dynamics of evolution of some statistical-economic indicators. More precisely, a number of factors that were, before these years, very limited compared to the values observed in the old EU member states, recently have become important developments, but it will probably be necessary to wait a long time before they reach the natural saturation period [40].

Table 3. Agritourism in Romania. Current situation and future forecasts.

	Current Situation									Future Forecasts	
	2010	2011	2012	2013	2014	2015	2016	2017	2020	2030	
No. of agritourism guesthouses (number) (NATE)	1354	1210	1569	1598	1665	1918	2028	2556	3236	7113	
Index of net using the agritourism accommodation capacity (%) (IAA)	12.4	13.8	13.2	12.6	13.2	15.1	15.5	15.7	17.8	23.2	
Population occupied in agritourism (persons) (POA)	4372	4327	4672	4520	4756	4830	4912	4978	5072	5409	

Source: Processing by data from the National Institute of Statistics, <http://statistici.insse.ro>, consulted in 6 May 2018 [39].

Such an evolution (see Table 3-future forecast) can be described using a logistic model [41,42]. with a statistically assured correlation coefficient, $r = 0.947$ at $sig. < 0.001$. Thus, for the year 2020 the function determined indicates the value $NATE_{2020} = 3236$ respectively for the year 2030 being $NATE_{2030} = 7113$ agritourism guesthouses.

The net index using the agritourism accommodation capacity was described by the logistic function, whose expression we have determined as being (see Table 3-future forecast):

$$IAA = \left(1/50 + 4.6 \cdot 10^{37} \cdot 0.9564^Y\right)^{-1}$$

having $r = 0.835$ at $sig. = 0.01$. For the year 2020, the function indicates the value $IAA_{2020} = 17.8$ respectively $IAA_{2030} = 23.2$ for the year 2030.

The dynamics of the occupied population in agritourism was established as a function, depending of the number of guesthouses at the time, using the function (Figure 3):

$$POA = 5690.94 - 2 \cdot 10^6 / NATE$$

having $r = 0.957$ at sig. < 0.001 . For the year 2020, the function indicates a population occupied in agritourism in a number of $POA_{2020} = 5072$ respectively of $POA_{2030} = 5409$ people in year 2030.

As a comparison, Italy and Austria, especially in the mountain area, have more than 2.5 million accommodation places and host more than 50 million tourists annually. This is in conditions, in which the mountain is the main attraction, but Romania has a mountain area of over 70,000 square kilometers, and Italy and Austria have just over 50,000 square kilometers. To get deeper, the average annual occupancy degree of the guesthouses of Romania is half (25–30 days) compared to the two countries where it reaches 60 days. That means hundreds of millions of euros each year [43].

4.2. Specific Features of the Agritourist Activity from the Apuseni Mountains Area

Over time in the Apuseni Mountains, the rural specificity of the region has directly determined and influenced the specific way of life of this area. The socio-economic problems of the Apuseni Mountains area are related to the high degree of dispersal in the territory of human settlements, which determines major deficiencies in the provision of technical and public infrastructure, as well as the negative dynamics of the population caused by the high level of emigration and demographic aging. The complexity of agritourism activity for the area in question is supported, firstly, by the fact that the Apuseni Mountains include six counties and three development regions, the solution of the various problems regarding the development of the area embraces a large number of institutions, or the correlation of measures and actions that will be undertaken in each region will have to extend beyond the administrative boundaries of the regions. This is because the processes and phenomenon have zonal features that do not stop at the arbitrary border of the regions and the characteristics of such a tourist development program for the Apuseni Mountains region involves simultaneous marketing and financing programs.

If we were to undertake a diagnosis of the tourist activity of the area, we could conclude that many disparities are registered according to some studies in the field. [16–18,22,44,45] (see Table 4):

- The natural tourism potential, meaning the geographical conditions, specific to the area, represents strong points when we speak about the agritourism sector of this area.
- The anthropic potential can contribute to the increase of income and to attracting young people to the rural area, taking into account the agritourism activities. This statement is based on the fact that a large part of the area's localities are very good at preserving traditions. The rural area has not lost its originality, from its attractive side, but has supported the preservation of the identity of settlements, culture, and traditions.
- Another positive aspect is the fact that lately we became aware of the existence of a great tourist potential and the area begun to be promoted, but still quite shy.
- The total accommodation capacity of the Apuseni Mountains area represents about 9.74% of the accommodation capacity at the national level.

Table 4. The main disparities of the Apuseni Mountains area-brief SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis.

Weakness/Threats	Strong Points/Opportunities
<ul style="list-style-type: none"> - The tourist potential of the area is exploited only in a small extent (12 hotels, classified with one or two stars, 20 villas, classified with one-four stars, 6 motels classified with one or two stars, 16 cottages, classified with one-three stars, 3 holiday villages, located in: Boga, Fantanele, Vartop, 202 households/agritourism guesthouses). - Absence of public services (water, canal, thermal energy) at the level of rural localities. - The general access infrastructure is one of the major weaknesses (low degree of road equipment, underdevelopment of the utility distribution network, places that are not yet electrified). - Labor force (high share of unemployed, dependence of the workforce on mining enterprises, migration of the population and village disappearance). - Tourist potential is not capitalized: lack of local brands and tourist products, lack of specialized training, lack of guidance to tourist areas, the existence of a poorly diversified offer. - Poor cooperation at local level. 	<ul style="list-style-type: none"> - Favorable areas to agritourism: Aries area, Belis-Fantanele areas, Buntesti, Pietroasa, Budureasa areas, Gurahont-Halmagiu areas, Gurahont-Halmagiu areas, that can contribute to the increase of income and attracting young people to the rural area. - Lately it has learned about the idea of a great tourist potential and has begun to be promoted. - Components of the possible agritourist product (relief resources and those with rural features, gastronomical elements, the existence of traditions, customs, folklore and local architecture. - The economy is predominantly agrarian, but the income from agriculture is quite low, and the territorial services are use below standard, which requires a reorientation towards those activities that can capitalize the existing resources.

Source: Authors' opinions, based on previous researches [16–18,22,44,45].

However, as observed above, with all the great potential, there are many negative elements that influence the development of agritourism in the studied area:

- Absence of public services (water, canal, thermal energy) at the level of rural localities;
- The general access infrastructure is one of the major weaknesses, which has a long way to go to improve up to the national average quality level and still very much to be comparable to the infrastructure of tourist areas of the West, if such an evolution of localities in the area is desired;
- Non-exploitation of the agritourism potential, the causes being multiple:
- agritourism is practiced more in a spontaneous form rather than an organized form, following the motto “the tourist finds the agritourist farm and it is not the farm that attracts the tourists”. This is one of the reasons that demonstrate the need to organize this form of tourism with the involvement of the authorities and the local community, so it will be economically viable for both.
- the owners of tourist locations have entrepreneurial skills, in general, and less specialized knowledge in the field of tourism and management skills in this field;
- tourist locations have a low occupancy degree compared to the potential;
- services offered to tourism consumers are not very diversified (accommodation and meals).

However, in years to come, the Apuseni Mountains must be perceived, not only as a geographical individuality, but also as an individuality from economic or tourism point of view. Therefore, according to some studies, a reconsideration of the area's economy is necessary and it requires a reorientation towards those activities that can capitalize on the existing resources. In recent years, all counties from Apuseni Mountains have documented their main guidelines for future development by focusing on local tourism, of which agritourism has a very large share, but, in the future, a series of measures are needed for a re-launching solution for the rural areas, such as: the need to modernize tourist offers by developing regional products; raising workforce qualification; improving service quality; improving public-private collaboration and partnership; the qualitative and quantitative increase of tourism promotion [22,44,46,47].

4.3. Identifying Representative Aspects Related to the Development and Capitalization of Households from the Apuseni Mountains Area through Agritourism

A large number of Apuseni Mountains localities are very good at preserving traditions. (see Figure 4). If traditions and customs areas are added to mountain natural resources and specific traditional products, [5,22,45,48] a valuable tourist product emerges, which could contribute to the increase of income and to attracting young people to the rural area [17,18]. The rural settlements, which have a remarkable historical, natural and cultural potential and have developed the necessary tourist infrastructure (guesthouses/agritourism farms) have entered in the tourist circuit.

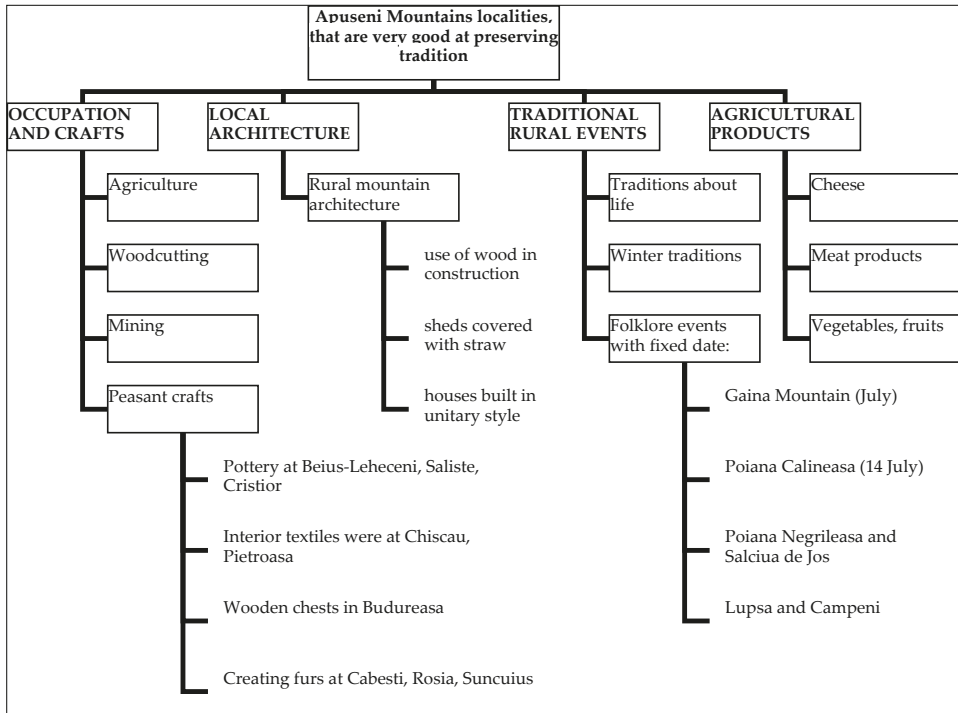


Figure 4. Apuseni Mountains localities, that are very good at preserving tradition [17,18].

The agritourism guesthouses (see Table 5) are unequally distributed in the counties constituent of Apuseni Mountains and starting from this premise, the questionnaires that we applied were different in number.

Table 5. Distribution by counties of the guesthouses questioned.

Cluj County	Bihar County	Alba County	Arad County	Salaj County	Hunedoara County
60 guesthouses	44	48	7	23	20

Thus, in order to pursue the purpose of the paper, to underline the evolution of the current situation of the current situation of the agro-tourism guesthouses in Romania and for future forecasting through a logistic model, specifically on the Apuseni Mountains, we have used a questionnaire that was conducted through a face-to-face interview, and addressed directly to the owners of agritourism structures. The samples were selected by taking into consideration their representativeness for agritourism activity (to practice both agriculture and tourism), their geographic position, their

economic representativeness. The number of questionnaires applied was directly correlated with the number of households approved for agritourism from the area, and then statistical calculations were performed in SPSS.

The items included in the questionnaire, ten in number, are grouped in the following categories:

- finding information about the characteristics of respondents;
- finding aspects related to the surface of the farm and the existence/inexistence of a specialized training;
- finding aspects related to the development and capitalization of households in the area analyzed through agritourism;
- finding aspects related to the motivation of tourists to practice agritourism in the area/agritourism guesthouses under analysis;
- finding aspects about the willingness to cooperate, in order to improve the agritourism product, from the owners of the agritourism structures.

Characteristics of respondents. A number of 202 owners of agritourist households/guesthouses from the chosen area have been chosen, namely from the Apuseni Mountains area, their distribution on counties, showing a representative share for Cluj County (29.70), followed by Alba County (23.76%), Bihor County (21.78%). (see Table 6).

Table 6. Grouping the respondents from Apuseni Mountains area by counties and sex.

Sex Studied Area	Measure Unit	Men	Woman	Total	
				No.	%
Alba County	No.	32	16	48	23.76
	%	66.66	33.33		
Bihor County	No.	23	21	44	21.78
	%	52.27	47.72		
Cluj County	No.	42	18	60	29.70
	%	70.00	30.00		
Hunedoara County	No.	13	7	20	9.90
	%	65.00	35.00		
Arad County	No.	3	4	7	3.46
	%	42.85	57.14		
Salaj County	No.	15	8	23	11.38

The lowest share of the number of persons interviewed is attributed to Arad County (3.46%). Their distribution by gender is as follows: 128 men, representing 63.36% from the total and 74 women, respectively 36.63% from the total of those interviewed.

Aspects related to the surface of the farm and the existence/non-existence of specialized training among owners of agritourism households. Because agritourism activity is conditioned by agricultural activity, the existence of the farm was an aspect pursued by us in the questionnaire. Thus, from the 202 agritourist guesthouses surveyed, (see Table 7) within the six counties, a large proportion of farms have a small size farm between 5 and 10 hectares.

Table 7. Aspects related to the surface of the farm and the existence/inexistence of specialized training.

Studied Area	Measure Unit	Existence/Non-existence of Some Specialized Training		Agricultural Area of the Farm (Ha)		
		Yes	No	5.00–10.00	10.00–20.00	20.00–30.00
Alba County	No.	19	29	41	7	-
	%	39.58	60.41			
Bihor County	No.	17	27	36	8	-
	%	38.63	61.36			
Cluj County	No.	34	26	42	12	6
	%	56.66	43.33			
Hunedoara County	No.	7	13	14	4	2
	%	35.00	65.00			
Arad County	No.	3	4	4	2	1
	%	42.85	57.14			
Salaj County	No.	10	13	16	7	-
	%	43.47	56.52			

On the other hand there is a small number of agritourism guesthouses on farms between 20 and 30 hectares. The existence/non-existence of specialized training among agritourist households is also a representative aspect to be followed, and following the data processed in Table 4 and comparing it to other studies [48] within the area, we see an improvement in the last few years. Despite the training situation in the area studied, in five counties of six, the number of Apuseni Mountains has improved, and the number of agro-tourism guesthouses that do not have specialized training is higher than the number of those who work in the field of agritourism.

Aspects related to development and capitalization of households in the area analyzed through agritourism. Essential elements of agritourism activity, but also some of the main attraction points for tourists, practicing craft activities with the involvement of tourists, or the capitalization of products from their own farm through agritourism were also on the list of aspects we pursued in this paper. The extent to which agritourism represented or not a growth opportunity for their own household, or in other words, the degree of awareness of the beneficial aspects of agritourism activity by those who carry it. (see Table 8), has also been determined.

Table 8. Development and capitalization of households from the area analyzed through agritourism.

Studied Area	Measure Unit	Capitalization of Product from Own Farm Through Agritourism (1)		Practicing Craft Activities with the Involvement of Tourists (2)		Agritourism Represented or not a Growth Chance for Own Household (3)	
		Yes	No	Yes	No	Yes	No
Alba County	No.	29	19	23	25	43	5
	%	60.41	39.58	47.91	52.08	89.58	10.41
Bihor County	No.	25	19	21	23	36	8
	%	56.81	43.18	47.72	52.27	81.81	18.18
Cluj County	No.	48	12	38	22	53	7
	%	80.00	20.00	63.33	36.66	88.33	11.66
Hunedoara County	No.	13	7	9	11	14	6
	%	65.00	35.00	45.00	55.00	70.00	30.00
Arad County	No.	7	-	2	5	4	3
	%	100.00	-	28.57	71.42	57.14	42.85
Salaj County	No.	18	5	12	11	17	6
	%	78.26	21.73	52.17	47.82	73.91	26.08

It can be noticed that, in the analyzed area, (see Table 8, (1)) for the first aspect subjected to analysis, the capitalization of the products from the farm through agritourism, a favorable trend is registered or an essential condition of agritourism activity (that of the production of a part of the products capitalized through tourism). In all six counties, the majority share tends towards the capitalization of products from their own farm through agritourism. Among the products capitalized through agritourism

activities are: livestock products, vegetables, fruits, many obtained under biological conditions, fishery products, wine products.

The second aspect analyzed, (see Table 8, (2)) practicing craft activities with the involvement of the tourists, registered a positive trend, mostly at the level of Cluj and Salaj counties, but also a negative one at the level of Alba, Bihor, Arad, Hunedoara counties. The evolution is a favorable one as this statement is based on the fact that 5–7 years ago the share of those who did not value the capitalization of the traditional crafts through agritourism within this area was much higher. The craft activities practiced in the guesthouses questioned are: various woodworking, picking forest fruits in the guesthouses from Alba County; weaving, sewing folk costumes, wood processing, picking forest fruits in the guesthouses from Cluj County; zootechnical activities (sheep, cows) specific to mountain areas, specific culinary activities, weaving/sewing in the guesthouses from Bihor County; techniques of making wine, agritourism occupations, hunting, fishing in guest houses from Arad County.

Although agritourism is practiced more in a spontaneous rather than in an organized form in the studied area, the owners of tourist locations have entrepreneurial skills in general, and less specialized knowledge in tourism and management fields; the tourist locations have a low occupancy degree compared to their potential; and services offered to tourists are diversified to a limited extent. Agritourism represented a chance that for their own households to grow in the overwhelming opinion of those interviewed, (see Table 8, (3)).

Through the capitalization of the local resources and products by combining two activities, the agricultural activity as a core activity and the tourism activity as complementary activity, the profitability of agritourism is high, being in fact a chance for alternative income for rural areas with those in the mountain area. The practice of agritourism promotes the idea of combining economic interests in community development, the conservation of nature, and in other words, it ensures the sustainable development of the area. The entrepreneurs in the area can have a successful model for capitalizing the tourist potential of the area and for supplementing farm incomes through the possibility of adding a modest income from tourism activities.

Aspects related to the motivation of tourists to practice agritourism in the area/agritourism guesthouses under analysis. From this point of view, it was intended to identify the motivation for which the tourists chose the guesthouses in the Apuseni Mountains/agrotourism and three major aspects were considered (see Table 9):

- Special tourist resources specific to the Apuseni Mountains area;
- Quality–price ratio;
- The products/services offered by the agritourism guesthouses from the area.

Table 9. The motivation of tourists to practice agritourism in the area/agritourism guesthouses from Apuseni Mountains.

Studied Area	Special Tourist Resources		Quality–Price Report		Products/Services Offered	
	No.	%	No.	%	No.	%
Alba County	22	45.83	14	29.16	12	25.00
Bihor County	15	34.09	13	29.54	16	36.36
Cluj County	23	38.33	18	30.00	19	31.66
Hunedoara County	12	60.00	-	-	8	40.00
Arad County	-	-	5	71.42	2	28.57
Salaj County	3	13.04	11	47.82	9	39.13

We have obtained this information through the questionnaire, questioning the owners of agritourism guesthouses. The conclusions reveal the fact that, from the experience of agritourism farm owners, tourists are attracted by the exceptional tourist resource, at a higher share, by the quality–price report on the second place and then by the products offered. Although the aspect of the diversification

of tourism products and services offered is still to be worked on, it is apparently one of the attractive elements to tourists in the area.

The Apuseni Mountains area is valuable in terms of the existence of traditional resources and products that can be exploited by agritourism, and there are agritourism structures that attract tourists throughout the year (both in summer and winter). In conclusion, agritourism is a lever for local development, but we still have to solve a number of problems that this area is currently facing.

Aspects related to the identification of the desire to collaborate in order to improve the agritourism products from the owners of the agritourism structures. In recent years, all counties in the Apuseni Mountains have documented their main directions regarding future development, focusing on local tourism, within which agritourism has a huge share.

For agritourism to be truly a solution for the economic recovery of rural areas in the future, a series of measures are needed, such as: the modernization of tourist offers; creating some tourist products that highlight the “brand” of the area; collaboration between those involved in the implementation of this activity and the application of public-private partnerships would be just a few examples (see Table 10). The research made shows that the owners of agritourism guesthouses identify as future actions the increase of agritourism product quality/branding (in a large percent in Bihor County and Alba County, and in a small percent in Arad County form example) and, secondly, it is necessary to create tourism programs that focus on the life of the farm (Arad County having for this aspect the largest percent, the explanation deriving from the fact that here agritourism is at the beginning of development compared to the other counties). Regarding the third direction for improving the agritourism product, counties Salaj, Hunedoara, Bihor and Cluj consider opportune to focus on promotion and distribution.

Table 10. Identifying the desire to collaborate in order to improve the agritourism product.

The Studied Area	Measure Unit	Desire for Collaboration		Directions for Improving Agritourism Product		
		Yes	No	Increasing Quality	Focusing on Life on the Farm	Focusing on Promotion and Distribution
Alba County	No.	33	15	31	13	4
	%	68.75	31.25	64.58	27.08	8.33
Bihor County	No.	27	17	29	7	8
	%	61.36	38.63	65.90	15.90	18.18
Cluj County	No.	46	14	37	13	10
	%	76.66	23.33	61.66	21.66	16.66
Hunedoara County	No.	11	9	9	7	4
	%	55.00	45.00	45.00	35.00	20.00
Arad County	No.	6	1	3	3	1
	%	85.71	14.28	42.85	42.85	14.28
Salaj County	No.	16	7	10	6	7
	%	69.56	30.43	43.47	26.08	30.43

4.4. Current Situation and Future Forecasts Regarding Agritourism from the Apuseni Mountains Area

For future forecasts concerning agritourism in the Apuseni Mountains area, a special tourist resource, the quality–price report must be taken into account, as well as a focus on the products and services offered (see Table 9). Also, from the identification of representative aspects related to the development and capitalization of households in the Apuseni Mountains area through agritourism, it is concluded that agritourism entrepreneurs capitalize products and craft activities with the involvement of tourists from their own farms through agritourism, an aspect which, in most part, represents a chance for their own household to grow (see Table 8). In this way entrepreneurs are becoming aware of the opportunity of agritourism as an activity, identifying the desire to collaborate (see Table 10), the need to increase the agritourism product quality through some tourism programs with an emphasis on increasing quality, a focus on the life on the farm, and strong and sustained promotion (see Table 10).

Starting from the existing and the forecast situation (see Table 11), we have considered that such an analysis at the level of the analyzed area is appropriate. Just as at the national level, in

the Apuseni Mountains region there has been an upward trend, during the analyzed period, in the number of agritourist accommodation structures; in other words, an increased interest from the agritourism entrepreneurs. Although there is an increase during the analyzed period, in 2010 the number of agritourism units from the Apuseni Mountains represented 11.37% from the total number of agritourism guesthouses at a national level (see Table 11), in 2017 the Apuseni Mountains held a share of 9.74% of the total number of agritourism guesthouses existing at the national level, for the following reasons: the increase of the number of structures at the national level, the poor infrastructure of the area, the low financial motivation of the human resources from the area, or the preference of the consumers for other tourist areas. Also, in the net index using agritourism, the accommodation capacity follows an upward trend, reaching 15.6% in 2017. With regard to the population occupied in agritourism, the trend is growing, but the growth is less visible. (see Table 12).

Table 11. The current situation of the distribution of agritourism guesthouses from the Apuseni Mountains area, by counties.

Types of tourist Accommodation Structures	County	Years							
		2010	2011	2012	2013	2014	2015	2016	2017
		UM: Number of Units							
Agritourism guesthouses	Alba	29	45	50	49	56	59	60	75
	Arad	13	8	13	14	11	12	12	9
	Hunedoara	11	7	7	7	6	8	9	20
	Bihor	5	1	8	13	14	18	23	44
	Cluj	90	54	63	50	40	36	38	77
	Salaj	6	6	9	9	12	16	19	24
Total agritourism guesthouses from Apuseni Mountains		154	121	150	142	139	149	161	249
No. of agritourism guesthouses at national level		1354	1210	1569	1598	1665	1918	2028	2556

Source: processing according to data from the National Institute of Statistics, <http://statistici.insse.ro>, consulted in 6 May 2018, and other administrative data [39].

Table 12. Current situation and future forecasts regarding some agritourism indicators from the Apuseni Mountains area.

	Current Situation								Future Forecasts	
	2010	2011	2012	2013	2014	2015	2016	2017	2020	2030
No. of agritourism guesthouses (number) (NATE)	154	121	150	142	139	149	161	249	261	560
Index of net using the agritourism accommodation capacity (%) (IAA)	10.2	11.4	13.5	12.6	12.9	14.3	15.4	15.6	18.6	26.7
Population occupied in agritourism (persons) (POA)	413	373	422	457	466	481	493	517	540	601

Source: processing according to data from the National Institute of Statistics, <http://statistici.insse.ro>, consulted on 6 May 2018, and other administrative data [39].

The number of agritourism guesthouses in the Apuseni Mountains was established in the form of the logistic evolutionary model (Figure 5):

$$NATE = \left(1/2500 + 8 \cdot 10^{76} \cdot 0.9135^Y \right)^{-1}$$

with a statistically assured correlation coefficient $r = 0.797$ at $sig. = 0.03$. For the year 2020, the determined function indicates the value of $NATE_{2020} = 261$ respectively for the year 2030, $NATE_{2030} = 560$ agritourism guesthouses.

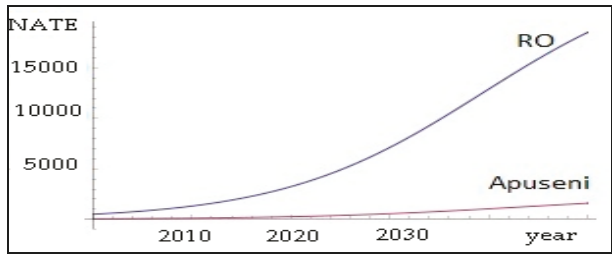


Figure 5. Graphical representation of the functional model for the number of agritourism establishments (NATE).

The net index using the agritourism accommodation capacity evolves after the logistic expression as being (Figure 6):

$$IAA = \left(1/50 + 7.8 \cdot 10^{55} \cdot 0.9637^Y\right)^{-1}$$

having $r = 0.910$ at $\text{sig.} = 0.004$. For the year 2020, the function indicates $IAA_{2020} = 18.6$ and $IAA_{2030} = 26.7$ respectively for the year 2030.

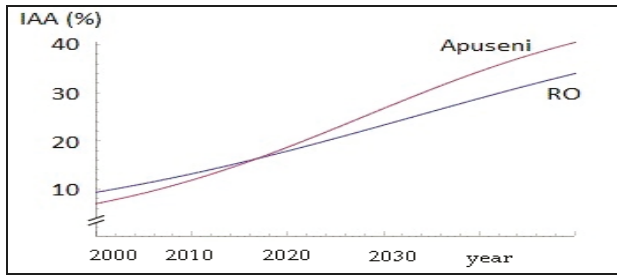


Figure 6. Graphical representation of the functional model for the net index using the agritourism accommodation capacity (%) (IAA).

The population occupied in agritourism has been established in the same way, as a function of the number of boarding houses, using the function (Figure 7):

$$POA = 654.825 - 29818/NATE$$

having $r = 0.808$ at $\text{sig.} = 0.028$. For the year 2020, the function indicates a population occupied in agritourism in a number of $POA_{2020} = 540$; respectively, in the year 2030 we predict that the number of people employed in agritourism would be $POA_{2030} = 601$.

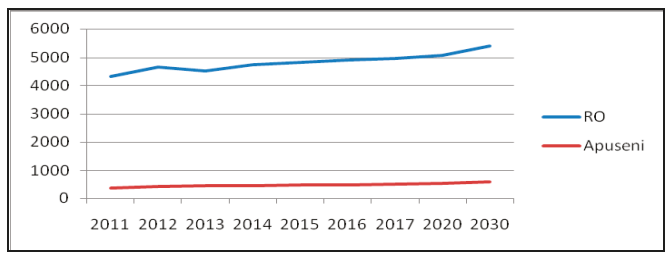


Figure 7. Graphical representation of the annual evolution of population occupied in agritourism (POA).

5. Discussion

Starting from the current situation and following the forecasts made, it was found that the forecast situation is satisfactory, the area being one with high tourist potential. Consequently, the premise of this scientific paper, in the sense that the people have become aware of the existence of great tourist potential, is supported by the statement that the total accommodation capacity of the Apuseni Mountains area is about 74% of accommodation capacity at national level, with good expectations in the future. Given the fact that the area confronts many disparities, described in Table 4, it can be stated that *agritourism activity* has the potential for development, being a particularly valuable one, which somewhat *supports the sustainability* of this field of activity for rural area of Apuseni Mountains, through many benefits [49,50]:

- It ensures unaltered preservation of rural structures and the ways of living, customs and traditions, in a word of a traditional culture made available to tourists. This form of tourism is a multifunctional activity, representing more than just a stay at a peasant guesthouse. In general, the interest in natural and rational nutrition represents a factor of attraction that is increasingly manifested by tourists from developed countries. Due to the relatively small size of the companies involved (most of them family business), agritourism is able to satisfy the demands of tourists for quality, intimacy and originality, and the flexibility of purchased services ensures their adaptability to individual needs.
- Diversification and, in conclusion, a certain stabilization of the local economy, with the possibility of creating some business opportunities [51,52] and through them the emergence of new jobs.
- the superior capitalization of the natural and anthropic valences of rural settlements from the area studied through agritourism, the accent being placed on maintaining attractive traditional components at the same time with the increasing the requirements of modern, competitive tourism; co-participation and co-hosting of tourist-host and host-receptor, which are defining elements.
- Positive evolutions among tourists-that come in contact with other mentalities, customs, with another way of organizing life, as well as among hosts who might learn about a series of characteristics of the environment and the places from where tourists come from. Thus, through the exchange of information, the rural world comes out of isolation, and it protects its cultural dimension, viability and stability through tourism.

Nowadays, the growth of global tourism has caused a significant interest in research focused on the impact of the tourism on environment and community, specifically on agritourism structures. [53,54] The development of agritourism [55,56], in the studied area, will lead to a sustainable economic development of rural localities. From the forecasts, we can gather that there will be positive influences on the environment, agriculture, transport, construction, processing and food-processing industries, and services from various fields. The development of rural entrepreneurship, in the agritourism field, based on managerial knowledge and non-polluting technologies, in harmony with the principles of sustainable development, can certainly become a profitable activity for the inhabitants of the Apuseni Mountains, ensuring them a decent living and a job.

Therefore, entrepreneurs from the area can, through agritourism activity, develop a successful model in order to capitalize the tourist potential of the area, and to supplement the income from agricultural holdings through the opportunity of adding a modest income from tourism activities. Such a proposal aims at an approach focused on that area, which capitalizes the advantages of the region: agriculture, tourism and recreational activities.

6. Conclusions

The reason for choosing the Apuseni Mountains area derives from the fact that it has high agritourism potential, so the desire to highlight this area is justified. We support the above affirmation

by the fact that the area takes part of the rural areas with special tourist potential, at the European level, which can offer to tourists a variety of tourism products.

This paper has as its purpose to highlight some aspects regarding the importance of the necessity of implementing the sustainability of the agritourism field, with benefits for rural settlements, taking as an area of study the mountainous rural environment of the Apuseni Mountains. During the study, we drew some conclusions that have been demonstrated in the paper:

- At present, the combination between sustainable rural development and tourism facilities represent a “must have”, so a particular importance is given to agritourism, both in the specialized literature and in practice. The rural settlements where agritourism will be practiced will become places where all elements of local sustainable development will be assembled, and become a possible alternative to the problems of agriculture and the “health” of the rural environment, the development of agritourism, related to the evolution of agriculture, takes many forms and brings many benefits also for tourists that are willing to practice this activity if some principles are respected, these aspects are underlined in Figure 1, Figure 2, Table 1, Table 2.
- In order to underline the evolution of the current situation of Romanian agritourism guesthouses and to make future forecasts, a logistic model, according to Table 2, was used. We can conclude that, regarding this purpose at the Romanian level, there are 2556 agritourism accommodation structures (see Table 3-current situation) with 44,499 accommodation places in year 2017, concentrated in different geographic areas of the country and using a logistic model; the result is that in 2030 these structures will be $NATE_{2030} = 7113$ agritourism guesthouses (see Table 3-future forecasts).
- One of the sub-purposes was to achieve a concrete study on the Apuseni Mountains by using a questionnaire so it can highlight the aspects related to: information about the characteristics of respondents; the surface of the farm and the existence of specialized training; the development and capitalization of households in the area analyzed through agritourism; the motivation of tourists to practice agritourism in the area under analysis; and the identification of the desire to collaborate in order to improve the agritourism product from the owners of agritourism structures. Therefore, we can conclude that, regarding the capitalization of the products from the farm through agritourism, a favorable trend is registered (Table 8). Regarding the capitalization of craft activities through tourism with the involvement of tourists, this registered a positive trend mostly at the level of Cluj and Salaj counties, but also a negative one at the level of Alba, Bihor, Arad, Hunedoara counties (Table 8). The owners of tourist locations have entrepreneurial skills, in general, and less specialized knowledge in tourism and management fields (Table 7). From the experience of agritourism farm owners, the tourists are attracted by the boarding house/area, due to the exceptional tourist resources and the quality-price report (Table 9). The research shows that the owners of agritourism guesthouses identify as future actions the increase of agritourism product quality/branding and, secondly, that it is necessary to create tourism programs that focus on the life of the farm. (Table 10).
- For the Apuseni Mountains area, some future forecasts were made by using a logistic model, and it was found that the forecast situation is a positive and satisfactory one; so the first indicator analyzed, NATE, will increase to 261 agritourism guesthouses in 2030, the second indicator, IAA, will also have a satisfactory evolution to 18.6% in 2013, and the third indicator POA, will also rise to 540 persons occupied in agritourism in 2030, according to the results from Table 12.

The time series for 2010–2017 indicate a significant increase regarding the indicators studied (IAA, NATE, POA). This aspect is largely due to the European/national support and funding programs that have been intensively carried out during this period, but also to a tendency to change the opinions of the population, especially young people. This is also evidenced by the increase in employment (IAA), which is noticeably higher in the Apuseni Mountains compared to Romania (Romania’s IAA shows an increase of 26.61% in the period 2010–2017 while at the level of the Apuseni Mountains,

the IAA shows an increase of 52.94%). This difference was observed against the background of a relatively similar growth in the number of units: NATE increased by 88.77% at the level of the whole country and at the level of the Apuseni Mountains only by 61.68%, but also a significant increase. Also the growth rate of the occupied population (POA) is higher in the Apuseni Mountains, the increase observed in this period being 25.18%, while in Romania the growth was 13.86%. These details clearly show the sustainability of an improved attitude of the population in terms of options regarding such non-tourist activities, which does not exhaust resources and preserves the environment. Moreover, the local population growth trend in these areas (POA) indicates with great certainty the possibility of professional reconversion of people who not long ago were undertaking other activities in the sense of being able to carry out activities that support and induce sustainability.

From the previous points in the paper, we have concluded that, regarding the specific peculiarities of agritourism activity from the Apuseni Mountains area, during recent years it developed great tourism potential, which has gradually begun to be used through agritourism structures to attract tourists throughout the year. Given the fact that the area is confronted with many disparities, described in Table 4, the statement that agritourism supports the sustainability of this mountainous rural area through many benefits, expressed in the text, is real. The transformations that need to take place in the rural area to support the connection between sustainable development and agritourism, in our opinion, are:

- raising the level of civilization and comfort of the boarding houses, in accordance with their originality and diversity.
- change of mentality, by giving up a way of thinking synthesized by the phrase “this is fine, too”, and understanding the exigencies and necessity of professionalism and performance in carrying out agritourism activities. As generous as the supply of certain components is, it does not necessarily prove to be profitable unless it manifests itself in a system that integrates all the factors that define the agritourism product (accommodation, tourist movement, animation, various activities, services, courtesy, exemplary cleanliness, attention to detail, etc.).
- the development of entrepreneurial spirit among the “natives”. Agritourism can only be developed under conditions of risk assumption, by those from rural households with the development of human health and the “health” of the environment, and through this achieve the main desideratum—the sustainability of the rural environment.

Obviously, it is not easy for transformations to take place in the studied area, especially because of the large territorial extension, but in the long term agritourism can support the emergence of horizons in the sustainable development of rural settlements, at least for the analyzed area.

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Article

Estimating the Impact of Air Pollution on Inbound Tourism in China: An Analysis Based on Regression Discontinuity Design

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Abstract: Prior studies have suggested the existence of a reverse causality relationship between air quality and tourism development: while air quality influences tourism, dynamic segments of the tourism industry (e.g., cruising, airline, foodservice) have impacts on air quality. This reverse causality hinders a precise estimate on the effect of air pollution on tourism development within a conventional econometric framework, since the variable of air pollution is endogenous. This study estimates the impact of air pollution on the inbound tourism industry in China, by controlling for endogeneity based on a regression discontinuity design (RDD). The estimate is derived from a quasi-experiment generated by China's Huai River Policy, which subsidizes coal for winter heating in northern Chinese cities. By analyzing data from 274 Chinese cities during the period 2009–2012, it is found that air pollution significantly reduces the international inbound tourism: an increase of PM₁₀ (particulate matter smaller than 10 μm) by 0.1 mg/m³ will cause a decline in the tourism receipts-to-local gross domestic product (GDP) ratio by 0.45 percentage points. This study also highlights the importance of controlling for endogeneity, since the detrimental impact of air pollution would otherwise be considerably underestimated. This study further demonstrates that, although air pollution is positively correlated with the average expenditure of each tourist, it substantially depresses the number of inbound tourists. The results imply that air quality could potentially influence inbound tourists' city destination choices. However, it is interesting to note that travelers in air polluted cities in China tend to spend more money.

Keywords: air pollution; inbound tourism; China, PM₁₀; regression discontinuity design

1. Introduction

Sustainability is rooted in environmentalism, and it has been regarded as a fundamental concept for tourism development [1]. A balance among environmental, economic, and social sustainability, the three main pillars of sustainability, is the key to achieving sustainable tourism development [2]. Since tourism has become one of the largest-growing economic sectors in the world, policy makers should shift their focus from the quantity of economic growth to the quality of growth, which could be determined by natural environmental performance. The impact of environmental factors (e.g., nice weather, personal safety, unpolluted environment, standards of hygiene of the destination) on the tourism industry cannot be overlooked, as they influence customers' destination choices [3,4], travel experiences [5], as well as tourist aesthetic judgement [6]. Moreover, pollution becomes a major health concern. For instance, 4.2 million deaths every year are linked to outdoor air pollution exposure [7]. However, it is noticed that the impact of environmental quality on tourism development has been examined less extensively than the impact of tourism on environmental quality.

Since 2014, air quality improvement has been regarded as a top priority for sustainable development by the United Nations Environment Assembly [8]. According to AirVisual [9], the top 10 polluted cities were dominated by India, Pakistan and China in 2018. It was reported that India's toxic air caused 1.24 million deaths in 2017 [10], and prompted visitors to defer or cancel their trips to destinations such as Delhi, Agra and Varanasi [11]. In Pakistan, air pollution led to an increase in asthma and other respiratory diseases [12]. China's problems with severe air pollution have also received worldwide attention in recent years. Haze, a serious health threat, has become one of the most disastrous weather events in China [13]. According to the Wall Street Journal [14], foreign visitors to Beijing, China suddenly declined by roughly 50% in the first three quarters of 2013. One of the main factors for the decline might be the city's notorious air pollution, as hyped by foreign media, which increases foreign visitors' perceptions of environmental risks in China.

Although the number of tourists inbound for China in 2017 reached 139 million, this only represented a 0.8% increase compared to last year. Dai Bin, the president of the China Tourism Academy, regarded environmental concerns as being one of the potential reasons for deterring international tourists [15]. It is implied that inbound tourism in China should be improved by adhering to the overarching goal of achieving sustainable tourism development. To provide additional evidence on the negative impact that air quality might have on inbound tourism in China, quantitative analyses are needed.

With the aim of providing a more precise estimation on the effects of air pollution, this study carefully considers the following points: (1) the development of tourism might, reversely, affect environmental quality. This is confirmed by some existing studies that have discussed the influence of the tourism industry on pollution. The existence of reverse causality hinders a precise estimate on the effect of air pollution on tourism development within a conventional econometric framework, as air pollution is an endogenous variable. This issue should be dealt with in econometric regressions. (2) This study takes into account the effect of China's Huai River Policy, which subsidizes coal for winter heating to people living in northern Chinese cities. Given that this policy has led to a dramatically higher degree of air pollution in northern China than that in southern China [16], a discontinuous distribution of air pollution around the north–south boundary could be observed. In this situation, regression discontinuity design (RDD) is regarded as a powerful method for dealing with the endogeneity of the air pollution variable, while identifying a causal effect from air quality to tourism development. (3) Given that the distribution of tourism resources is highly uneven in different districts in China, the representativeness of the sample used in analysis should be noted. Existing studies in literature have either investigated the circumstances at aggregate levels such as country- and province-levels, or have focused on some hot tourism destinations such as Beijing and Shanghai. If the study subject is the whole country or the provinces, the findings may be driven by circumstances in districts with large tourism scales. If only the hot tourism destination cities are considered, many cities would be ignored, even though they probably have distinct characteristics. Differently, this study analyzes China's city-level data instead of its national- or province-level data. Our sample consists of 274 cities, covering over 80% of the districts of China. (4) This study inspects the impacts of air quality on three tourism indicators: inbound tourism receipts, the number of arrivals, and the expenditure per tourist. These three variables are all crucial indicators in tourism analysis. This study attempts to provide a comprehensive understanding on how air quality influences the tourism industry.

This study contributes to the body of literature in two aspects. First, since this study addresses explicitly the endogeneity issue in the regressions, it probably provides a more accurate estimate on the damage of air pollution on China's inbound tourism. According to the estimates of this study, if PM₁₀ (particulate matter smaller than 10 µm) density increases by 0.1 mg/m³, the tourism receipts-to-local gross domestic product (GDP) ratio will decline by 0.45 percentage points, implying a reduction of 567 million RMB (approximately 80 million USD) in tourism receipts; the tourist arrivals-to-local population ratio will reduce by 4.6 percentage points, implying a reduction of 0.19 million tourists. The estimates of this study demonstrate that pollution's negative impact will

be substantially underestimated if the endogeneity is not mitigated. Second, this study is the first attempt to analyze the impact of air pollution on tourism over a wide sample of Chinese cities. The sample covers 274 cities, containing over 80% of Chinese cities. This sample includes not only a set of well-known cities with high levels of tourism development, but also many promising cities which currently have medium or small scales of tourism industries. Therefore, the empirical findings of this study reflect the general situations in China.

The rest of this paper is organized as follows. Section 2 presents a literature review on the interaction between air pollution and tourism. Section 3 illustrates the significant discontinuity of air pollution and tourism variables around the north–south boundary of China. Section 4 demonstrates the empirical model and the data used in the regressions. The estimate results are discussed in Section 5. Discussions are then presented in Section 6. Finally, Section 7 provides the conclusions, limitations of this study, and recommendations for future research.

2. Literature Review

This literature review section examines the bilateral causality between environmental quality and tourism development, with a special focus on air pollution issues.

2.1. The Relationship between Environment and Tourism

Numerous studies have investigated the impact of tourism growth on local economic development [17,18]. It has been acknowledged that tourism, especially in less developed countries, is regarded as a generator of economic benefits including improvements in employment, incomes and exports [19,20]. Since tourism development depends greatly on climatic and natural resources such as rivers, lakes, and landscape [21], tourism industry practitioners should optimize the use of the environmental resources to promote economic growth and alleviate poverty.

In recent decades, tourism was no longer a luxury good, but widely enjoyed by the general public. It is noticed that individuals' perceptions of tourism–environment relationship have changed due to tourism's potential impact on the natural environment such as noise pollution, water pollution, air pollution, biodiversity loss and coastal degradation [22–24]. The multiple segments of the tourism industry could also induce negative environmental impacts. For instance, tourism transport cruise ship emission could cause air pollution [25], and the hotel sector increases environmental burden due to its high level of energy and water consumption [26]. A recent report indicates that worldwide tourism industry accounts for 8% of global CO₂ emissions from 2009 to 2013 [27]. Increasing attention has been paid to the appropriate handling of the relationship between tourism and the environment rather than speeding up the tourism resources' exploitation and utilization.

In addition to the aforementioned studies highlighting the tourism-influenced environmental disturbances, a number of studies have indicated the impact of environment on tourism industry, especially for international tourism [28]. The rationale behind is that changes in climate or weather conditions could influence the demand for tourism. Poor environmental conditions in the destination country could reduce inbound travelers' visit intentions, while poor environmental conditions in the place of origin could serve as a push motivator for outbound travelers [29].

2.2. The Impact of Air Pollution on Tourism

Air pollution not only harms the health of tourists, but also reduces air visibility, which directly influences tourists' travel experiences. Therefore, good air quality is indispensable for tourism sustainability. As an increasing number of people are now aware of daily levels of air pollution, scholars have started to investigate the impact of air pollution on tourism, and they have found that haze-related air pollution significantly reduces a country's inbound tourism [30]. In recent years, China has been suffering from a serious air pollution problem, which has received worldwide attention since 2013. Beijing, the capital of China, once reached a PM_{2.5} (particulate matter smaller than 2.5 μm) concentration value that was around 40 times the World Health Organization's maximum

guideline [31]. Tourists' perceptions of haze pollution alter the tourism seasonality in Beijing [4]. Since then, China's air pollution issues have become the focus of some studies examining the relationship between air pollution and tourism.

From a micro-level perspective, Becken et al. [32] conducted a survey on US and Australian residents, and found that their perceived air quality risk in China has a significant negative impact on destination image and visit intention. Similarly, Peng and Xiao [33] examined the impact of smog in the air on the domestic travel demand to Beijing, and found a significant indirect impact of travel risk perception on avoidance tendency, mediated by travel dissatisfaction and negative destination image.

Evidence on the negative impacts of air pollution on tourism have also been found from macro-level analyses. Deng et al. [34] report that industrial waste gas emissions in provinces of China have a significant negative effect, both directly on the local inbound tourism industry, and indirectly via a spillover effect on other provinces. Using Google Trends search results, Xu and Reed [35] reported that the people's high degree of concerns about the pollution in China resulted in lower inbound tourism. In a study for 24 Chinese cities, Zhou et al. [36] reported that if the value of the air pollution index increased by 1% over the last month, the number of inbound tourist arrivals in the current month would decline by 0.25%. Other researchers have reported similar findings, with a focus on one specific city or scenic spot in China, including the Sun Moon Lake Scenic Area in Taiwan [37] and Shanghai [38].

These aforementioned studies all support the claim that air pollution harms tourism development. However, it is noticed that previous studies failed to take into account the endogeneity of air pollution resulting from reverse causality, which might result in either an overestimation or an underestimation of the results. More specifically, in the case that the development of the tourism industry mitigates air pollution, an OLS (Ordinary Least Squares) estimate with tourism development as the dependent variable and pollution as the explanatory variable, may report a spurious negative coefficient. This causes an overestimate on the effect of air pollution. On the contrary, in the case that tourism development increases pollution emissions, an OLS estimate on the air pollution's impact tends to underrate the real magnitude. The previous literature indicates that these two different circumstances are both possible.

2.3. The Impact of Tourism on Air Pollution

Tourism, often referred to as the non-smoking industry, has now posed potential threats to natural resources in the world. Belsoy et al. [39] summarized that the negative environmental impacts of tourism include the disruption of ecological life systems, air, water and noise pollution, and pressure on land resources. According to a recent study on the carbon footprint of global tourism, the tourism industry is responsible for 8% of global greenhouse gas emissions [27]. Several scholars also reported that tourism expansion exacerbates pollution. For instance, Azam et al. [40] reported a positive effect from tourists' arrivals on CO₂ emission in Malaysia. Similar findings are reported for some other countries, including Turkey [41], Cyprus [42], and 35 Organization for Economic Co-operation and Development (OECD) countries [43]. Lu et al. [44] found that the growth of domestic tourism earnings in Qingyang City, Gansu, China increases the local discharge of garbage; and air pollutants discharged from waste disposal have become an air pollution source [45]. Based on a study in the Mallorca area of Spain, Saenz-de Miera and Rosselló [24] found that a 1% increase in tourist numbers was related to a 0.45% increase in PM₁₀ concentration levels.

Meanwhile, there were actually some contradictory findings suggesting that the development of tourism may mitigate air pollution. For example, Azam et al. [40] observed a negative effect of tourism on CO₂ emissions in Thailand and Singapore, which was consistent with studies on EU countries [46,47] and Singapore [48]. A regional panel analysis in China showed that tourism has a negative impact on CO₂ emissions in eastern China [49]. Ahmad et al. [2] further reported that the impact of tourism on environmental quality varies across different provinces. Specifically, a negative

impact was found in the Ningxia, Qinghai, Gansu, and Shaanxi provinces, while a positive impact was found in Xinjiang.

In a nutshell, the literature shows that tourism and air pollution may have bilateral interactions. It is thus necessary to consider the potential endogeneity of air pollution when estimating its impact on the tourism industry.

3. The Discontinuous Distribution of Air Pollution and Tourism in China

This section demonstrates the discontinuous distribution of air pollution and tourism development around the north–south boundary of China. The relevant stylized facts will serve as a foundation for the further analyses in this paper.

3.1. The Discontinuous Distribution of Air Pollution

The line formed by Huai River and Qinling Mountains, at around latitude 33° N, is the geographic boundary between northern and southern China. Due to budgetary limitations, since the planned economy period, the central government has implemented distinct policies for winter indoor heating in these two regions [16]. In most northern cities, the government subsidizes coal for winter indoor heating against the cold. This is called the “Huai River Policy”. In contrast, in the south, this policy is not prevalent. Since the use of coals generates substantial emissions, the air quality in the northern cities is worse than that in the south, *ceteris paribus*. This phenomenon was already confirmed in the literature. For example, Almond et al. [16] showed that the degree of air pollution has a considerable leap from the south to the north side of the Huai River–Qinling Mountains. Chen et al. [50] and Ebenstein et al. [51] utilized this discontinuity to estimate the impact of air pollution on health. Huang and Lanz [52] used this to evaluate impacts on wage and house price.

Figure 1 demonstrates the discontinuous distribution of air pollution in 274 Chinese cities located at different degrees of latitude. We use the PM₁₀ concentration as the indicator of air pollution. From the graph, we observe that the degree of air pollution has a strong relationship with the latitudes of the cities. In southern China, the air pollution increases along with the latitude. Around the north–south boundary, latitude 33° N, annual average PM₁₀ density has an apparent jump, from around 0.08 mg/m³ to nearly 0.1 mg/m³. This occurs as the result of the Huai River Policy. After this leap, air quality is stable for some degrees of latitude. Finally, when the latitude becomes larger and larger, the level of air pollution declines.

We also formally utilize a regression discontinuity design to test the effect of the Huai River Policy on PM₁₀ density. (The details about the data and sample are documented in Section 4) We use the following empirical model of a sharp RDD:

$$PM10_i = \alpha_0 + \alpha_1 North_i + \eta F(Latitude_i) + v_i, \quad (1)$$

where $PM10_i$ is the density of the PM₁₀ concentration in city i ; $North_i$ is a dummy variable indicating whether the city is located in north China, and thus, covered by Huai River Policy (=1 if in the north, and =0 otherwise); $Latitude_i$ is the degree of latitude; v_i is the error term. Within the RDD framework, $PM10_i$ is the outcome variable; and $F(Latitude_i)$ represents the polynomial terms of the running variable $Latitude_i$. We are interested in the average treatment effect (ATE) of the policy, which is measured by the coefficient α_1 . The model is estimated by a local polynomial regression. We first use a second-order polynomial, and allow different bandwidths at the two sides of the policy cutoff boundary, to obtain our baseline estimate. The point estimate, which confirms a statistically significant impact at the 10% significance level, is shown in the first row of column (a) in Table 1. The Huai River Policy raised PM₁₀ by 0.018 mg/m³. To check the robustness, in column (b), we add the logarithm of GDP and population as additional covariates, and, in column (c), we use a third-order polynomial function and restrict using the same bandwidths on both sides of the policy boundary. Our finding holds.

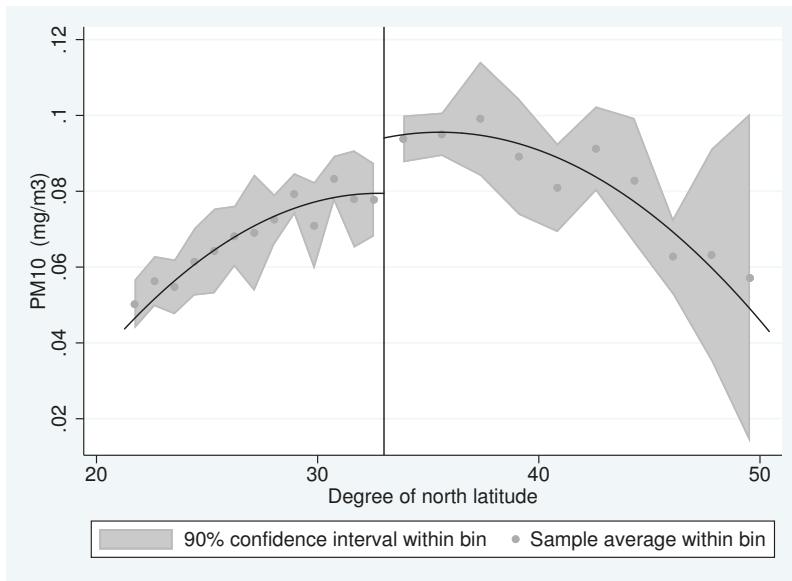


Figure 1. Annual average PM₁₀ concentrations of Chinese cities in different latitudes. **Note:** The gray points represent the annual average PM₁₀ concentrations across a set of cities grouped in bins according to the degrees of latitude. The gray shadowed area demonstrates the 90% confidence interval for each bin. The bins were constructed through a data-driven procedure based on the mean squared error (MSE)-optimal bandwidth selector. The vertical line in the middle of the figure indicates the position of latitude 33° N. The plotted curves report the fitted values from a regression of PM₁₀ concentration on a second-order polynomial in latitude, estimated separately on each side of the north–south boundary.

Table 1. Regression discontinuity estimates of the impacts of the Huai River Policy.

Outcome Variable	(a)	(b)	(c)
PM ₁₀	0.018 * (0.011)	0.012 * (0.007)	0.022 * (0.013)
Tourism receipts	−0.338 *** (0.128)	−0.304 *** (0.112)	−0.192 * (0.098)
Tourist arrivals	−3.968 ** (1.695)	−3.226 * (1.747)	−1.963 (1.361)
Observations	274	274	274
Polynomial type	2nd order	2nd order	3rd order
Same bandwidths in both sides	No	No	Yes
Additional covariates	No	Yes	No

Note: (1) Statistical significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Standard errors are in parentheses. (2) This table presents the regression discontinuity estimates of the impacts of the Huai River policy on three outcome variables: PM₁₀ concentration (mg/m³), the ratio of inbound tourism receipts to local GDP (%), and the ratio of inbound tourist arrivals to the local population (%). (3) Column (a) gives the baseline result; column (b) adds the logarithm GDP and the population as additional covariates; column (c) uses a third-order polynomial function and restricts using the same bandwidths at both sides of the policy boundary.

3.2. The Discontinuous Distribution of Tourism

Now, we move to inspect the relationship between tourism and latitude. Figure 2 shows the distribution of receipts from inbound tourism as a ratio to local GDP. Similar to what we can read from Figure 1, this graph shows at least two important points. First, the tourism revenue has a strong relationship with latitude. Second, there is an obvious discontinuity around the latitude 33° N. Particularly, the tourism receipts-to-GDP ratio suddenly drops when moving from the south to the

north. This abrupt negative change of tourism revenue is in contrast to the sudden positive change of PM_{10} displayed in Figure 1. Thus, it is reasonable to conjecture that tourism revenue has a negative correlation with air pollution.

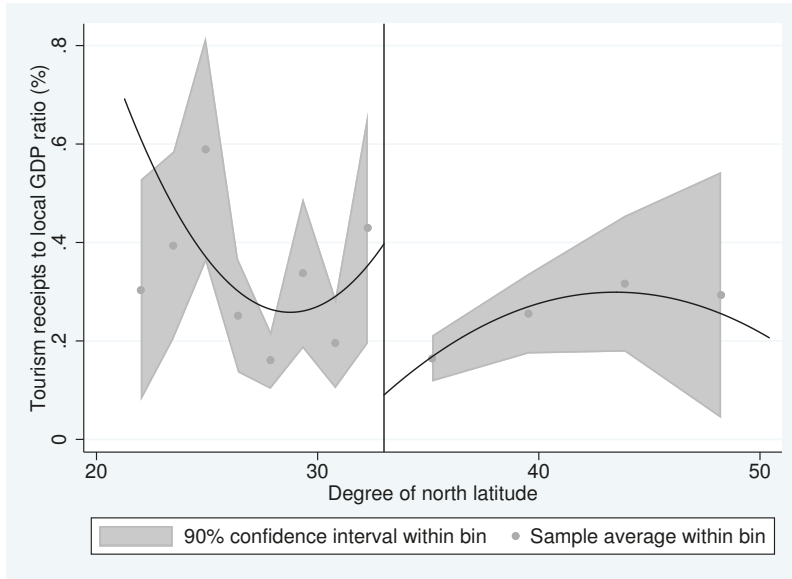


Figure 2. Annual average inbound tourism receipts-to-local GDP ratios of Chinese cities in different latitudes. **Note:** The gray points represent the annual average inbound tourism receipts-to-local GDP ratios across a set of cities grouped in bins according to the degrees of latitude. The gray shadowed area demonstrates the 90% confidence interval for each bin. The bins were constructed through a data-driven procedure based on the mean squared error (MSE)-optimal bandwidth selector. The vertical line in the middle of the figure indicates the position of latitude 33° N. The plotted curves report the fitted values from a regression of the tourism receipts-to-local GDP ratio on a second-order polynomial in latitude, estimated separately on each side of the north–south boundary.

Figure 3 shows the relationship between the latitude and the ratio of inbound tourist arrivals to the local population. The distribution of the tourist arrivals-to-population ratio was similar to that of tourism revenue, as shown in Figure 2. It is especially notable that there is substantial discontinuity around the north–south boundary. Compared to the situation of PM_{10} demonstrated in Figure 1, we guess that tourist amount is negatively correlated with air pollution.

Besides the visual observation of the sudden drop of tourism around the north–south boundary, we also use a regression discontinuity design to examine the effects of the Huai River policy. The estimates rely on Equation (1), with the outcome variables of tourism receipts and tourist arrivals. As documented in the second and third rows of column (a) in Table 1, our baseline RD estimates show that Huai River Policy resulted in significant drops in tourism receipts and tourist arrivals at the 1% and 5% significance levels, respectively. The results are robust if we add additional covariates, or change the polynomial type and the bandwidth, as shown in columns (b) and (c) of Table 1. The finding that Huai River Policy had significant impacts on tourism generates a strong implication. Since this policy was designed only for winter-heating purpose, it has no direct link to tourism. Taking into account that we had already confirmed the crucial influence of the Huai River Policy on PM_{10} concentration, we can reasonably believe that the impact of the policy on tourism is through the channel of air pollution.

This implies that a dummy variable, indicating whether a city is covered by the Huai River Policy, can work as the instrument variable for air pollution to help identify pollution’s impacts on tourism.

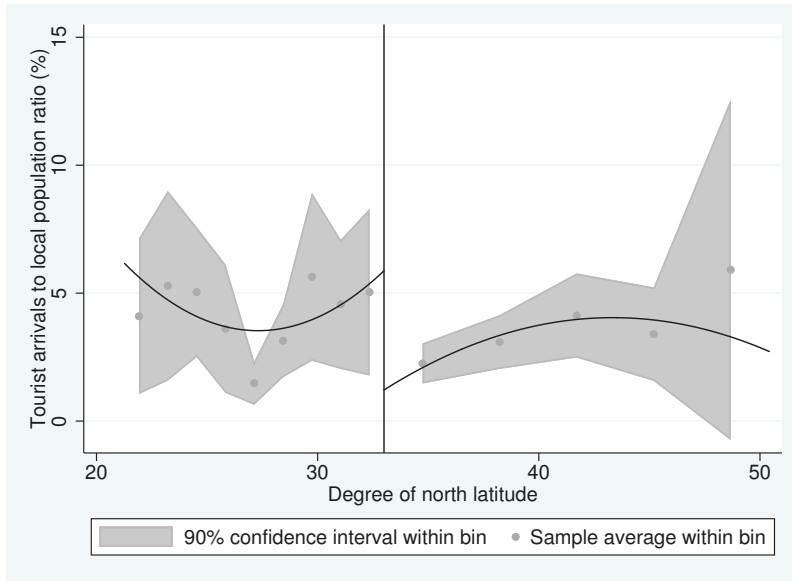


Figure 3. Annual average inbound tourist arrivals-to-local population ratios of Chinese cities in different latitudes. **Note:** The gray points represent the annual average inbound tourist arrivals-to-local population ratios across a set of cities grouped in bins according to the degrees of latitude. The gray shadowed area demonstrates the 90% confidence interval for each bin. The bins were constructed through a data-driven procedure based on the mean squared error (MSE)-optimal bandwidth selector. The vertical line in the middle of the figure indicates the position of latitude 33° N. The plotted curves report the fitted values from a regression of tourist arrivals-to-local population ratio on a second-order polynomial in latitude, estimated separately on each side of the north–south boundary.

4. Empirical Model and Data

In this section, we explain the econometric model and the data used in our empirical analyses.

4.1. Empirical Model

In order to estimate the impact of air pollution on tourism development, a linear model is established as follows:

$$Tourism_i = \beta_0 + \beta_1 PM10_i + \theta' X_i + \varepsilon_i, \tag{2}$$

where the dependent variable $Tourism_i$ is an indicator of tourism development in city i . We primarily consider $Receipts_i$, the ratio of inbound tourism receipts to local GDP. We use this relative value of tourism revenue to GDP, rather than an absolute value of revenue volume because we want to measure the degree of tourism development in each city, rather than its scale. Besides the index of tourism revenue, later we will also investigate its extensive and intensive margins separately. The indicator for the extensive margin is $Tourist_i$, which is the number of inbound tourist arrivals as a ratio to local population. The indicator for the intensive margin is $Expenditure_i$, which is the average expenditure of each tourist. The core explanatory variable of interest in our analyses is the level of air pollution. We use $PM10_i$, density of PM_{10} concentration, to measure air pollution. Ebenstein et al. [51] showed there was significant damage from PM_{10} concentrations in Chinese cities on the health of the residents. Furthermore, as one of the most important components of TSP (Total Suspended

Particulates), PM_{10} substantially lowers the air visibility. Thus, PM_{10} is a crucial indicator for air pollution (In the robustness analysis section, we will additionally test the validity of our findings using another two indices: AQI_i , the Air Quality Index; and $PM_{2.5}$, the density of $PM_{2.5}$). X_i is a vector of control variables including: the number of 5A- and 4A-rated scenic spots ($Scenic_i$), the number of star-rated hotels ($Hotel_i$), the density of the transportation infrastructure ($Transport_i$), industrial structure ($Structure_i$), government size ($GovSize_i$), and the GDP per capita ($GDPpc_i$). ε_i represents the error term.

As discussed in the Introduction and Literature Review, air pollution is probably endogenous because tourism may have impacts on environmental quality. An estimate on the coefficient β_1 without dealing with endogeneity potentially introduces bias. To mitigate endogeneity, we use a 2SLS-IV (two-stage least squares-instrumental variable) approach based on the discontinuous distribution of air pollution and tourism in China, as already analyzed in Section 3. Previously, we have used RDD to confirm the significant impacts of the Huai River Policy on both pollution and tourism variables. Since the design purpose of the policy had nothing to do with the local tourism industry, the policy's impact on tourism should be indirect and works via some mediating variables. If the policy only influences tourism through its impacts on pollution, it is valid to treat Equation (1) as the first stage equation in a 2SLS regression. To simplify, we employ a parametric version of Equation (1). Specifically, in the 2SLS our first stage regression is:

$$PM_{10}_i = \gamma_0 + \gamma_1 North_i + \gamma_2 Latitude_i + \gamma_3 Latitude_i^2 + u_i, \quad (3)$$

where $North_i$ is a dummy variable indicating whether the city is located in northern China (=1 if in the north, and =0 otherwise); $Latitude_i$ is the degree of latitude; $Latitude_i^2$ is the square of latitude; u_i is error term. After Equation (3) is estimated, the fitted value of PM_{10} density is used to replace PM_{10}_i in Equation (2). This constructs the second-stage regression. Similar 2SLS models, which utilize the nonlinear relationship between air pollution and latitude with the existence of the Huai River Policy, have been exploited in Chen et al. [50], Ebenstein et al. [51], and Huang and Lanz [52]. Chen et al. [50] and Ebenstein et al. [51] evaluated the impact of air pollution on health. Huang and Lanz [52] investigated its impacts on wage and house prices.

Table 2 gives detailed definitions of all the variables used in our regressions.

Table 2. List of variables used in the regressions.

Variable	Definition
Dependent variables	
<i>Receipts</i>	Receipts from the inbound tourism industry, as a ratio to local GDP (%)
<i>Tourist</i>	Number of inbound tourist arrivals, as a ratio to the local population (%)
<i>Expenditure</i>	Average expenditure of each inbound tourist (\$1000), equaling the total tourism receipts divided by tourist arrivals
Core explanatory variables of interest	
<i>PM10</i>	Density of PM_{10} (particulate matter smaller than 10 μm) concentration in the air (mg/m^3)
<i>AQI</i> (used for robustness check)	Air quality index, calculated according to the Technical Regulation on Ambient Air Quality Index (HJ 633-2012) published by China's Ministry of Environmental Protection
<i>PM2.5</i> (used for robustness check)	Density of $PM_{2.5}$ (particulate matter smaller than 2.5 μm) concentration in the air (mg/m^3)

Table 2. Cont.

Variable	Definition
Control variables	
<i>Scenic</i>	Number of 5A- and 4A-rated scenic spots, divided by the local population (since a 5A-rated spot is usually considered to be much more attractive, one 5A spot is regarded as equal to three 4A spots)
<i>Hotel</i>	Number of star-rated hotels, divided by the local population (we use the average value during 2000 and 2003, to deal with the concern that the number of hotels in the current period is affected by contemporary tourism development)
<i>Transport</i>	Density of transportation infrastructure, proxied by the road length (km) per area (km ²)
<i>Structure</i>	Industrial structure, proxied by the ratio of the service sector GDP to the industrial sector GDP
<i>GovSize</i>	Government size, measured by the ratio of fiscal spending to local GDP
<i>GDPpc</i>	Logarithm of GDP per capita (RMB, at the constant price in 2000) (we use the average value during 2000 and 2003, to deal with the concern that the overall economic growth in the current period is affected by contemporary tourism development)
Variables for the first stage regression in 2SLS	
<i>North</i>	Dummy variable indicating the city location (=1 if the city is located in north China, =0 otherwise)
<i>Latitude</i>	Latitude of the city center

4.2. Data

We collect data for approximately 300 prefecture-level administrative districts in China (For convenience, we will refer to “cities” as including these administrative districts). This initial sample is highly representative since it covers around 90% of the area of China. The sample period spans over four years, between 2009 and 2012. We use the annual average over these four years to avoid disturbances at the business cycle frequency. We extract the data of PM₁₀ density from a series of yearly published reports—“The Report on the State of the Environment of China”. The reports, written by China’s Ministry of Environmental Protection (MEP), provide official data about the environmental quality in different areas of China. The reason why we choose the period 2009–2012 is that MEP released a relatively complete PM₁₀ dataset, which covers approximately 300 cities in China, during this four-year period. In the robustness checks, we will also use the measures of *AQI* and PM_{2.5} concentration to inspect our findings. *AQI* is calculated according to the method in the MEP’s Technical Regulation on Ambient Air Quality Index (HJ 633-2012), using the data of PM₁₀, SO₂, and NO₂ documented in MEP’s report series. The data of PM_{2.5} is from NASA’s Global Annual PM_{2.5} Grids data [53,54]. (Here, we clarify several important points about the *AQI* and PM_{2.5} indicators. (1) Following Huang and Lanz [52], we use the data of PM₁₀, SO₂, and NO₂ to calculate the value of *AQI*. Strictly speaking, we should also take into account the values of CO, O₃ and PM_{2.5}, according to the standard of the MEP’s Technical Regulation on Ambient Air Quality Index (HJ 633-2012). However, the Report on the State of the Environment of China only presents the data for the former three pollutants. Because of this data availability issue, the latter three pollutants are not considered in our calculations. The detailed index construction method is discussed in HJ 633-2012 and Huang and Lanz [52]. (2) The data provided by MEP is based on direct measurements in different local observation stations. Thus, MEP’s data can accurately reflect the degree of air pollution of each city. The PM_{2.5} data provided by NASA comes from the remote sensing measurement of space satellites. The measurement error is relatively larger, compared to the data from local observation stations. Thus, our baseline regressions utilize MEP’s data, while NASA’s data is used for robustness checks. (3) In our sample, the Pearson correlation coefficient between *AQI* and PM₁₀ is 0.986, and the correlation between PM_{2.5} and PM₁₀ is 0.178. Given our sample size, *AQI* and PM_{2.5} are both positively correlated

with PM_{10} at the 1% statistical significance level. Our later robustness checks will also make it clear that our empirical findings hold no matter which air pollution index is used. In other words, we have no concerns about the selection of the pollution indicators because our analyses are not sensitive to that.) The latitude data is from NGCC, the National Geomatics Center of China. The variables of tourism and other control variables are from the China Statistical Yearbook for Regional Economy in the corresponding years.

There are several special cities within our sample. We regard them as outliers. For example, every year, a very large volume of travelers from Hong Kong and Macao visit Shenzhen and Zhuhai cities for the purposes of shopping, and visiting relatives or friends, as these cities are mutually adjacent. A similar phenomenon also occurs in some border cities. In Chinese inbound tourism statistics, those travelers who usually arrive and leave within one day are all recorded as inbound tourists. Obviously, those visitors are different from “inbound tourists” in a general sense, and, thus, should be cleaned out from our sample. To get rid of the outliers, we delete cities with values of $Receipts_i$, $Tourist_i$, or $Expenditure_i$ within the top 5% of the initial sample. Finally, we obtain a sample of 274 cities, covering over 80% of the area of China. Table 3 gives the summary statistics of the variables.

Table 3. Summary statistics.

Variable	Mean	SD	Min	Max
<i>Receipts</i>	0.281	0.369	0	1.814
<i>Tourist</i>	3.706	5.263	0.003	30.798
<i>Expenditure</i>	0.383	0.179	0.062	0.948
<i>PM10</i>	0.079	0.026	0.026	0.276
<i>AQI</i>	0.064	0.013	0.028	0.162
<i>PM2.5</i>	0.034	0.016	0.003	0.073
<i>Scenic</i>	4.396	4.199	0	25
<i>Hotel</i>	0.071	0.067	0.005	0.412
<i>Transport</i>	0.912	0.484	0.029	2.054
<i>Structure</i>	0.761	0.347	0.125	2.692
<i>GovSize</i>	0.199	0.146	0.048	1.112
<i>GDPpc</i>	8.797	0.613	7.329	10.721
<i>North</i>	0.496	0.501	0	1
<i>Latitude</i>	33.433	6.757	21.27	50.42

5. Results

In this section, we report our estimation results. Section 5.1 discusses the estimated impact of air pollution on inbound tourism receipts. Section 5.2 discusses the impact on tourist arrivals. In Section 5.3, we evaluate the effect on expenditure per tourist. We find that air pollution significantly reduces tourism revenue and tourist amount, but it positively correlates with the expenditure per tourist. Our estimates indicate that the deprivation of air quality has different effects on the extensive and intensive margins of tourism: pollution incurs some potential tourists to give up travel plans, but it raises the expenditure of tourists who ultimately arrive at China. The overall effect of air pollution on Chinese inbound tourism development is detrimental.

5.1. The Impact of Air Pollution on Tourism Receipts

In order to evaluate air pollution’s impact on tourism revenue, the inbound tourism receipts-to-local GDP ratio ($Receipts_i$) works as the dependent variable in Equation (2). For the purpose of comparison, we first report the OLS estimate in column (a) of Table 4. The result shows a significant negative effect of PM_{10} concentration on tourism revenue. Regarding the control variables, we find that the amount of scenic spots ($Scenic_i$), amount of hotels ($Hotel_i$), road density ($Transport_i$), and the relative size of the service sector ($Structure_i$) all have significant positive correlations with tourism receipts. The estimated coefficients of these control variables are consistent with previous literature.

In addition, we detect a positive correlation between the government size ($GovSize_i$) and the tourism revenue, probably because Chinese local governments play crucial roles in the economic development and the transformation of industrial structure. The coefficient of GDP per capita ($GDPpc_i$) is positive, but not statistically significant.

Since air pollution is possibly endogenous, the OLS estimate reported in column (a) may have considerable bias. In order to mitigate the endogeneity, we now exploit the 2SLS-IV approach. The estimates and the associated test statistics from 2SLS are displayed in column (b) of Table 4. The Durbin χ^2 statistic and the Wu–Hausman F statistic are 7.005 and 6.952, respectively. These two statistics are both significant at the 1% level, rejecting the null hypothesis that PM_{10} is exogenous. This endorses the necessity for using the IV approach to mitigate endogeneity. The Hansen J statistic is 0.742, which does not reject the joint null hypothesis that our instruments are valid instruments, i.e., uncorrelated with the error term, and that the excluded instruments from the estimated equation are correctly excluded. This indicates that our selection of instrument variables is suitable. The estimated coefficient shows that, after controlling for the endogeneity, air pollution indeed significantly reduces inbound tourism receipts. It is especially notable that the coefficient of PM_{10} in column (b) is -4.477 . Its magnitude is substantially larger than that of -1.408 , the estimated coefficient in column (a). This makes it clear that, if we fail to consider endogeneity, air pollution’s damage on China’s inbound tourism would be significantly underestimated.

Our finding is not only statistically significant, but also economically significant. According to our 2SLS estimate, if PM_{10} density increases by 0.1 mg/m^3 , the tourism receipts-to-local GDP ratio will decline by 0.45 percentage points. In our sample, the average GDP of the cities is around 126 billion RMB, and a decline of 0.45 percentage points means a reduction of 567 million RMB (approximately 80 million USD). This is a huge loss.

Table 4. Impact of air pollution on tourism receipts.

Variable	Robustness Check					
	OLS	IV	IV (LIML)	IV (GMM)	IV (Use AQI)	IV (Use $PM_{2.5}$)
	(a)	(b)	(c)	(d)	(e)	(f)
PM_{10}	-1.408^*	-4.477^{**}	-4.504^{**}	-3.995^{**}		
AQI					-8.556^{**}	
$PM_{2.5}$						-29.686^{**}
Scenic	0.019^{***}	0.019^{***}	0.019^{***}	0.020^{***}	0.019^{***}	0.024^{***}
Hotel	2.089^{***}	1.826^{***}	1.823^{***}	1.845^{***}	1.795^{***}	0.713
Transport	0.091^*	0.114^{**}	0.114^{**}	0.116^{**}	0.107^{**}	0.780^{**}
Structure	0.160^{**}	0.219^{***}	0.220^{***}	0.208^{***}	0.220^{***}	0.154^*
GovSize	0.560^{**}	0.635^{**}	0.635^{**}	0.641^{**}	0.599^{**}	0.314
GDPpc	0.061	0.105	0.105	0.104	0.102	0.121
Constant	-0.691	-0.899	-0.901	-0.932^*	-0.668	-0.832
Observations	274	274	274	274	274	274
Adj- R^2	0.322	0.28	0.28	0.292	0.283	-0.194
Durbin χ^2 stat.	-	7.005^{***}	-	-	7.116^{***}	8.566^{***}
Wu–Hausman F stat.	-	6.952^{***}	-	-	7.006^{***}	8.552^{***}
Hansen J stat.	-	0.742	0.741	0.742	0.486	0.601

Statistical significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

To validate our finding, we conduct several robustness checks for our 2SLS estimate. In columns (c) and (d), we report the results using LIML-IV (Limited Information Maximum Likelihood-IV) and GMM-IV (Generalized Method of Moments-IV), respectively. We find that the coefficients demonstrated in column (b) do not have large changes. In other words, our results are reliable. Furthermore, we address the concern that PM_{10} is perhaps not the most crucial indicator for air pollution, when the tourists make their decisions. We reestimate Equation (2) by using another two

indices of air pollution. In column (e), we use *AQI*; in column (f), we use $PM_{2.5}$ concentration. Our previous finding still holds: air pollution significantly decreases tourism revenue.

The variation of tourism receipts may be caused by variations in two dimensions: the extensive margin, namely, the number of tourists; and the intensive margin, namely, the average expenditure of each traveler. In the next two subsections, we analyze these two margins.

5.2. The Impact of Air Pollution on Tourist Arrivals

Now, we investigate the impact of air pollution on the number of inbound travelers. We use the ratio of inbound tourist arrivals to the local population ($Tourist_i$) as the dependent variable, to estimate Equation (2). The estimate results in Table 5 show a significant negative effect of air pollution on the tourist amount. The coefficient of PM_{10} reported in column (b) indicates that the tourist arrivals-to-local population ratio will reduce by 4.6 percentage points, if the PM_{10} density rises by 0.1 mg/m^3 . Among our sample cities, the average population is 4.1 million. Thus, a decline of 4.6 percentage points means a reduction of 0.19 million tourists. In columns (c)–(f), we demonstrate the results of the robustness checks. Clearly, we have a robust finding: air pollution incurs many potential tourists to give up their plans to visit China.

If we incorrectly ignore the endogeneity of air pollution, the damage would be substantially underestimated. Column (a) displays the result of the OLS estimate, which only reports a value of -20.776 for the coefficient of PM_{10} . This value is less than half of -46.066 , the estimated coefficient by the 2SLS-IV approach documented in column (b).

Table 5. Impact of air pollution on tourist arrivals.

Variable			Robustness check			
	OLS	IV	IV (LIML)	IV (GMM)	IV (Use AQI)	IV (Use $PM_{2.5}$)
	(a)	(b)	(c)	(d)	(e)	(f)
PM_{10}	-20.776^{***}	-46.066^*	-46.094^*	-44.488^{**}		
<i>AQI</i>					-86.828^*	
$PM_{2.5}$						-302.464^*
<i>Scenic</i>	0.278^{***}	0.280^{***}	0.280^{***}	0.277^{***}	0.280^{***}	0.328^{***}
<i>Hotel</i>	35.860^{***}	33.688^{***}	33.686^{***}	33.822^{***}	33.434^{***}	22.388^*
<i>Transport</i>	1.713^{**}	1.895^{***}	1.895^{***}	1.960^{***}	1.821^{***}	8.680^*
<i>Structure</i>	1.694^{**}	2.180^{**}	2.181^{**}	2.161^{**}	2.172^{**}	1.503^*
<i>GovSize</i>	4.179^{**}	4.800^{**}	4.800^{**}	4.806^{**}	4.424^{**}	1.522
<i>GDPpc</i>	2.013^{**}	2.378^{**}	2.378^{**}	2.358^{**}	2.343^{**}	2.539^{**}
<i>Constant</i>	-19.809^{***}	-21.526^{***}	-21.528^{***}	-21.530^{***}	-19.137^{**}	-20.809^{**}
Observations	274	274	274	274	274	274
Adj- R^2	0.493	0.479	0.479	0.481	0.476	0.227
Durbin χ^2 stat.	-	3.132^*	-	-	3.535^*	5.742^{**}
Wu-Hausman F stat.	-	3.064^*	-	-	3.464^*	5.672^{**}
Hansen J stat.	-	0.047	0.047	0.047	0.05	0.254

Statistical significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

5.3. The Impact of Air Pollution on Expenditure per Tourist

In this subsection, we consider whether air pollution affects the expenditure of a typical tourist. The average expenditure of each tourist ($Expenditure_i$) is used as dependent variable in Equation (2). Previously, when we estimated the influence of air pollution on tourism receipts ($Receipts_i$) and tourist amount ($Tourist_i$), we used the instrumental variables regarding the discontinuous distribution of PM_{10} to mitigate endogeneity. This time, however, when we regress $Expenditure_i$ on PM_{10_i} , we find that the statistic tests do not reject the null hypothesis of exogeneity. This enables us to use OLS directly. Our estimates are reported in Table 6. Our results show a strong positive correlation

between pollution and tourism expenditure per capita. According to the coefficient in column (a), if the PM₁₀ concentration rises by 0.1 mg/m³, the average expenditure per tourist will expand by 77.1 USD. The positive impact of air pollution on tourism expenditure does not necessarily imply that the tourists are willing to consume more in cities with more severe pollution. Instead, the reason is plausibly unpleasant: for example, air pollution may encumber the transportation system such that tourists need to increase transportation costs; additionally, tourists may have additional health care expenses because pollution increases the health risk. Therefore, in the long term, the positive impact of air pollution on tourism expenditure probably hurts the development of tourism by lowering tourists' experiences and the reputations of travel destinations. In columns (b) and (c), we make estimations by using AQI and PM_{2.5} as dependent variables, respectively. The results confirm the finding in column (a). Among the control variables, the hotel amount (*Hotel_i*) has a significant negative correlation to tourism expenditure, perhaps because a larger number of hotels indicates strong competition and lower average prices in the hotel industry; the coefficient of the relative share of service sector (*Structure_i*) is significantly positive, as tourists' expenditure is majorly aimed towards the consumption on services, and not of industrial products; local GDP per capita (*GDPpc_i*) has a significant positive coefficient, since the price level is usually higher in a city with a higher GDP per capita. The estimated coefficients of other control variables, *Scenic_i*, *Transport_i*, *GovSize_i*, are not statistically significant.

Our empirical analyses have found that air pollution reduces tourist arrivals, but it increases the average expenditure per tourist. The relative importances of these two effects determine the net effect of air pollution on tourism receipts. We can illustrate this via a simple example. Considering an "average" city with the initial *Tourist_i* value being at its mean level, 0.03706, and *Expenditure_i* being at its mean level, 383 USD, if PM₁₀ increases by 0.01 mg/m³, according to the estimated coefficients in column (b) of Tables 5 and 6, *Tourist_i* will decline by 0.0046—a reduction of 12.4%, and *Expenditure_i* will rise by 7.71 USD—an increase of 2%. Obviously, the relative magnitude of air pollution's negative impact on tourist arrivals exceeds that of pollution's positive impact on the tourism expenditure per capita. In consequence, the aggregate effect of pollution on tourism revenue is negative.

Table 6. Impact of air pollution on expenditure per tourist.

Variable	Robustness Check		
	OLS	OLS (Use AQI)	OLS (Use PM _{2.5})
	(a)	(b)	(c)
PM10	0.771 *		
AQI		1.579 **	
PM2.5			2.100 *
Scenic	0.003	0.003	0.003
Hotel	−0.453 **	−0.443 **	−0.413 **
Transport	0.005	0.006	−0.038
Structure	0.063 *	0.062 *	0.076 **
GovSize	0.08	0.085	0.114
GDPpc	0.159 ***	0.158 ***	0.164 ***
Constant	−1.125 ***	−1.164 ***	−1.160 ***
Observations	274	274	274
Adj-R ²	0.243	0.244	0.245

Statistical significance: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

6. Discussion

This study quantifies the influence of air pollution on the Chinese inbound tourism industry. It is found that air pollution significantly reduces tourism revenue and the number of international tourist arrivals, which is qualitatively consistent with the previous study results such as Deng et al. [34], Zhou et al. [36], Xu and Reed [38]. Some potential tourists might give up their travel

plans to China when they are aware of China's haze problem. It is suggested that tourism policy makers should roll out more environmental policies for tackling air pollution in China. In addition, they should make more efforts to promote tourism and culture in China worldwide to overcome travelers' fear of air pollution. In addition, due to the fact that air pollution is closely related to climate change on a global scale [55,56], air pollution in China could be a potential consequence of global climate change issue. Therefore, the findings of this study tend to raise public awareness of climate change and call for more sustainable tourism practices to preserve a healthy environment.

While the findings in this study emphasize the importance of good air quality for sustainable tourism, which is claimed by the existing literature, this study provides quantitatively novel insights. This study provides supplementary inputs to the view of Holden [57] that the tourism–environment relationship should be understood as being reciprocal. It is noted that air quality and tourism development have simultaneous impacts on each other. The existence of this bilateral causality results in the endogeneity of the regressor, which impedes a precise estimate for the impact of air pollution on tourism. If we fail to control for this issue, the impact may be either underestimated or overestimated. In this article, we take advantage of the quasi-experiment derived by the coal-based winter indoor heating policy in northern Chinese cities, to use the regression discontinuity design to quantify the influence of air pollution on Chinese inbound tourism. By analyzing data from 274 Chinese cities during the period of 2009–2012, it is found that an increase of PM_{10} by $0.1 \text{ mg}/\text{m}^3$ will cause a decline of the tourism receipts-to-local GDP ratio by 0.45 percentage points, and a shrinkage of the tourist arrivals-to-local population ratio by 4.6 percentage points. Failing to consider the endogeneity results in substantial underestimates: the OLS estimates merely report a reduction of 0.14 percentage points in tourism receipts, and 2.1 percentage points in tourism arrivals, respectively.

Additionally, it is interesting to find that air pollution increases the international tourists' average expenditure, which has not been reported in prior studies. The potential reason for this might be that tourists who ultimately make their decision to visit China are likely to have longer trips because haze impedes transportation. Based on retail therapy, it is also possible that travelers tend to make purchases to lessen their negative emotions (e.g., depression, anxiety) that are evoked by the severe haze-fog [58].

7. Conclusions, Limitations and Future Research

In conclusion, the overall effect of air pollution on Chinese inbound tourism development is detrimental. This study highlights the importance of good air quality for sustainable tourism, and demonstrates that the magnitude of regression coefficients is plausibly much larger than what has been estimated before.

Like any other studies, this study is bound by certain limitations. First, this study does not capture the air pollution trends in the most recent years, since the PM_{10} data for a wide set of Chinese cities released so far only covers the period from 2009 to 2012. The work could be improved if more data becomes available in the future. Second, while this study focuses on air pollution, it should be considered that other types of pollution (e.g., water pollution, noise pollution) might also affect tourism. If the alternative types of pollution could be measured precisely at the city level, a comprehensive evaluation on the impact of pollution on tourism would be promising.

Future research may explore the mechanisms underlying the relationship between air pollution and tourism expenditure at the micro-level. In light of the study of Wang et al. [29], who examined the effect of air pollution in the place of origin on outbound tourism demand by utilizing transaction data from a leading online travel agent (OTA) in China, it is also interesting to verify their results by using the data derived from MEP. Additionally, future studies could examine the role of China's air pollution control policies in the relationship between environment and tourism industry. The insights of this study can also be extended to assess the circumstances in other countries, especially those densely populated developing countries like India, Indonesia and Pakistan.

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Article

Community-Based Tourism as a Sustainable Direction in Destination Development: An Empirical Examination of Visitor Behaviors

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Abstract: Community-based tourism is an emerging form of sustainable tourism. Community-based tourism often brings various financial/non-financial benefits to local communities and maximizes sustainability at the local level. The present study was designed to uncover the role of community-based tourism performance in elucidating travelers' post-purchase decision-making process for sustainable destination products by considering the moderating effect of sense of belonging. A quantitative approach was adopted for the achievement of the research objective. A field survey conducted at community-based tourism destinations was utilized for data collection. The acceptable level of the measurement quality was demonstrated. The results of the structural equation modeling provided empirical evidence that community-based tourism performance significantly affects the formation of travelers' post-purchase intentions. In addition, the adequacy of the higher-order structure of community-based tourism performance was identified. The community-based tourism performance and intention relationship was also moderated by sense of belonging. With a lack of empirical research about community-based tourism, the findings of this research significantly add to the existing body of knowledge in sustainable tourism.

Keywords: community-based tourism; local community; sustainable tourism; destination development; sense of belonging; pro-social/pro-environmental behavior

1. Introduction

For the past few decades, sustainable development has increasingly become a vital issue at every tourism destination [1–3]. Likewise, sustainable tourism as a form of pro-social/pro-environmental traveling behavior has received increasing attention from destination researchers/practitioners as well as visitors [4,5]. Many destinations and tourism companies in the destinations have launched a variety of sustainable initiatives for preserving nature, conserving natural/local resources, protecting cultural authenticity, and achieving socio-economic benefits [2,3,6].

Community-based tourism an essential approach to tourism, efficiently and strongly supporting sustainability at the community/local level [7,8]. The successful development of the community-based tourism makes important contributions to bringing diverse benefits to the local destination (e.g., boosting quality job creations, inducing local economic development, helping eco-friendly tourism development, enabling community empowerment, and preserving the traditional value of the local community) [8–10]. In addition, travelers of the community-based tourism destinations are encouraged to engage in practicing pro-social/pro-environmental tourism behaviors in an active manner [5,11].

It is acceptable that community-based tourism is increasingly recognized as a crucial issue in the sustainable tourism context [9,12]. However, little research has assessed the community-based tourism performance of a destination. In addition, although visitors' behavior is indisputably a core of tourism destination development [1,2,5], to the best of our knowledge, no empirical research has yet investigated how such community-based tourism performance affects visitors' pro-social behaviors for sustainable destination products. Moreover, the significance of sense of belonging in explicating traveler purchase behaviors as a moderator has been frequently stressed by scholars in destination management [13,14]. Yet, the possible moderating influence of the sense of belonging on travelers' sustainable intention formation is seldom assessed.

Filling this gap, the present research attempted to explore the clear role of the performance of community-based tourism and its dimensions in explicating visitor post-purchase decision-making process by considering the moderating impact of sense of belonging. In particular, this research aimed to (1) examine the effect of community-based tourism performance on behavioral intentions (i.e., revisit intention and word-of-mouth intention), (2) discover the adequacy of the higher-order structure of community-based tourism performance and its function within the hypothesized conceptual framework, and (3) explore the moderating impact of sense of belonging. The study findings highlighted certain significant contributions for academicians and industry. It asserted the essential role of the sense of belonging in moderating the community-based tourism performance and traveler's behavior intention. This result extends the present conceptualization and identification of it to cover a wider range of tourism forms. It also provided in-depth consideration to the industry developers and DMO's to improve creating more tourism elements (i.e., tangible, intangible) that increases the linkage between local communities, tourists, and a place. The subsequent parts include the literature review, methodology, and result sections. In addition, a discussion and implications section are presented.

2. Literature Review

2.1. Community-Based Tourism Performance and Its Role

Sustainable tourism is one of the most important topics in the global tourism industry. Sustainability is often regarded as competitiveness in tourism destinations as travelers are increasingly aware of the pro-social/pro-environmental/conservation issues. Community-based tourism is an important type of sustainable tourism. Although the knowledge about community-based tourism has not been thus far sufficiently uncovered, several studies exist that have examined this sustainable form of tourism and its characteristics (e.g., [15–17]). According to Mayaka et al. [17] and Jones [18], the core of community-based tourism is the development of the community through tourism where its value extends beyond economy development. Although the relationship between community development and tourism in the community has been debated, it has been suggested that community-based tourism brings diverse positive outcomes (e.g., socio-economic development, local community ownership, human resource development, community strength and unity, community empowerment, ecological contribution/conservation), leading to the sustainable development of the local community [15–17,19,20].

Community-based tourism covers a variety of aspects of local culture: entertainment, people, natural environment, superstructure, food, products, accommodations [2,15,17,18,20–22]. Previous studies indicated that these factors are also essential attributes of a tourism destination [15,20,21,23]. Undoubtedly, maximizing the performance of these attributes contributes to eliciting travelers' positive post-purchase behaviors for tourism destinations [2,23]. Bitner et al. [24] indicated that performance refers to customers' perception/appraisal about the outcomes obtained through experiencing/consuming product attributes. Likewise, community-based tourism performance in the present research indicates travelers' perceived outcomes obtained from the experiences with community-based tourism attributes at the destination.

Customers often form post-purchase intentions and engage in repurchase or recommendation behaviors based on their appraisal of product/service performance [24,25]. A number of studies

in consumer behavior and tourism found the link between product performance and behavioral intentions [13,23–26]. In the retail sector, Chang et al. [26] found that the excellent performance of product attributes elicits patrons' positive evaluation of their product experiences and influences their favorable post-purchase decisions/behaviors. In the cruise sector, Chua et al. [13] assessed the effect of cruise tourism performance. Their finding revealed that customers repeat purchase and word-of-mouth intentions increase based on the performance of the cruise tourism product and its attributes. Consistently, in their empirical examination of tourists' behaviors at a tourism destination, Han et al. [23] found that tourists' perceived performance of destination attributes significantly increases their intention to revisit and recommend the destination. The findings of these studies supported Bitner et al.'s [24] and Oliver's [25] assertion regarding the positive link between product performance and behavioral intentions. Based on this evidence, we developed the following hypotheses:

Hypothesis 1. *Community-based tourism performance has a positive and significant influence on revisit intention.*

Hypothesis 2. *Community-based tourism performance has a positive and significant influence on word-of-mouth intention.*

2.2. Behavioral Intentions

Despite the various existing definitions on behavioral intentions, it is generally agreed that it is one's readiness/likelihood for a particular behavior [25,27]. In other words, it is an individual intention/perception toward using or consume a particular product or service. The term "behavioral intentions" is one of the most significant concepts in marketing and consumer behavior as customers' behavioral intentions for a product/service likely result in actual purchase/consumption behaviors [25]. Ajzen [27] and Perugini and Bagozzi [28] asserted that one's behavioral intentions are the most proximal and salient determinant of his/her actual behaviors. According to them, triggering the predictors of behavioral intentions is therefore the effective means of inducing the related behaviors due to the sturdy intention–behavior linkage. Behavioral intentions in consumer behavior indicate patrons' likelihood (or subjective probability) that they will engage in a given action [25,28]. Scholars in diverse contexts agree that the repurchase and recommendation intentions are the two major constituents of behavioral intentions [23,25,27,29]. These intentions are also described as revisit and word-of-mouth intentions. Overall, in the present study, behavioral intentions refer to travelers' willingness or perceived likelihood of engaging in revisit and word-of-mouth behaviors for the community-based tourism destination.

2.3. Sense of Belonging and Its Role

It is described as a critical psychological dimension that consists of a sophisticated interaction between people and a place to build up the person's/community sentiment [30,31]. A sense of belonging, alternatively termed "involvement" [14], is regarded as an essential concept in the community-based tourism sector [17]. While sense of belonging is an attitudinal/psychological term, its scope also encompasses engagement/attachment [32,33]. One can feel a sense of belonging to a both a person or place [34]. Unarguably, travelers' sense of belonging to a certain destination contributes to community development [17]. A sense of belonging as a concept with multiple facets is often described as the bonding between a traveler and his/her important place [35]. Giuliani [32] indicated that the major aspect of sense of belonging is emotional connection between two parties (e.g., traveler and place). When a visitor strongly feels a sense of belonging to a certain destination, he/she is likely to feel an emotional bonding with the destination and to be attached to the destination [36–38].

Strengthening customers' sense of belonging is widely believed to influence their post-purchase decision formation and behaviors [14,36,37]. In the tourism sector, Hyun and Han [37] examined the role of sense of belonging. Their empirical finding indicated that travelers' sense of belonging to a product significantly affects their intention generation process. More recently, in their research about patrons'

decision-making process, Han and Hyun [14] uncovered that the relationships among motivations, satisfaction, and loyalty intentions become stronger when patrons' feel a strong sense of belonging. In their empirical study, loyalty intentions were evaluated with repeat purchase and word-of-mouth intentions. Consistently, in the cultural tourism sector, Hung et al. [36] also demonstrated that on-site involvement in activities in a cultural tourism destination (on-site belonging to the activities) includes a significant influence on travelers' intention formation for the destination. These empirical studies discussed above supported the moderating nature of sense of belonging in a traveler's post-purchase decision-making process. Therefore, the following hypotheses were developed:

Hypothesis 3a. *Sense of belonging significantly moderates the relationship between community-based tourism performance and revisit intention.*

Hypothesis 3b. *Sense of belonging significantly moderates the relationship between community-based tourism performance and word-of-mouth intention.*

3. Methods

3.1. Measures and Questionnaire Development

To evaluate study variables, existing validated measurement items were adopted from the extant literature [13,14,25,27,39–43]. Multiple items and seven-point Likert type scale were used ("Strongly disagree" = 1—"Strongly agree" = 7). In particular, a total of three items were utilized to measure local culture (e.g., "I had the opportunity to experience various local ways of life."). (See Appendix A). We used three items for the evaluation of local entertainments (e.g., "I participated in unique activities at the CBT destination that I cannot usually experience in everyday life."). A total of three items for local people (e.g., "Local people at the CBT destination were friendly/kind.") was used. We utilized three items for the assessment of local natural environment (e.g., "The natural environment at the CBT destination was appealing."). We used two items to evaluate local superstructure (e.g., "The architecture at the CBT destination was unique."). A total of three items for local food and dishes (e.g., "I experienced good quality of local dishes in restaurants at the CBT destination.") were utilized.

In addition, we used two items for the assessment of local products (e.g., "In the CBT destination, I experienced a variety of products/brands in local shops."). A total of three items for local accommodations (e.g., "I experienced good quality of local life in the place of accommodation at the CBT destination.") was used. Moreover, we utilized three items for the evaluation of sense of belonging (e.g., "I felt a strong sense of belonging to the CBT destination and its settings/facilities."). Furthermore, we used two items for the assessment of revisit intention (e.g., "I will make an effort to experience the CBT destination again in the near future.") and two items for the evaluation of word-of-mouth intention (e.g., "I encourage my friends and relatives to experience the CBT destination."). The draft version of the survey questionnaire comprised these measures and questions for socio-demographic information. The questionnaire was pre-tested with tourism academics. After slight modification, it was also reviewed and finalized by academic experts.

3.2. Data Collection Procedure and Samples

In the present research, a nonprobability convenience sampling method was used. The field survey was conducted at famous community-based tourism sites in South Korea such as Bukchon Hanok Village, Ewha Mural Village, Seorae Village, Achasan Mountain Ecological Park, Seoul Forest Park, and Jeonju Hanok Village. Surveyors approached the actual visitors of the aforementioned places and invited them to participate in the survey. Particularly, representative CBT destinations in Korea were introduced first and then tourists were asked to mark on a region of CBT destinations that they had previously visited in the questionnaire. Each region was presented with various representative

CBT destinations, which were reviewed by two academics and professionals in the field of hospitality and tourism. During this process, only respondents who had previously visited CBT destinations were selected for the survey participation. After filling out the questionnaire, the participants returned the completed questionnaire onsite. The surveyors checked if there is any missing response. Through this process, a total of 428 usable responses were gathered. These cases were utilized for data analysis.

Among 428 respondents, 64.3% were female travelers, and 35.7% were male travelers. About 52.3% reported that they were four-year college graduates, followed by high school graduates or less (29.7%), two-year college graduates (11.7%), and graduate degree holders (6.3%). Regarding the participants' age, about 59.1% indicated that their age is less than 30 years old, followed by between 30–39 years old (18.7%), 50–59 years old (12.1%), 40–49 years old (7.7%), and 60 years old or more (2.3%). In terms of the duration of the stay, about 49.8% reported one day trip, followed by two days (25.9%), three days (16.6%), five days or more (4.2%), and four days (3.5%). When the participants' travel purpose was asked, about 68.0% indicated for relaxation, followed by nature/well-being (18.0%), enjoyment/pleasure (6.5%), socializing (3.3%), study (1.6%), other (1.4%), and business (1.2%).

4. Results

4.1. Data Quality Testing

A measurement model was generated by using a confirmatory factor analysis. Results showed that the model contained a satisfactory level of goodness-of-fit statistics ($\chi^2 = 620.694$, $df = 322$, $\chi^2/df = 1.928$, $p < 0.001$, $RMSEA = 0.047$, $CFI = 0.959$, $IFI = 0.919$, $TLI = 0.948$). All loading values (standardized) were significant ($p < 0.01$). In addition, internal consistency of the multiple-item measures was evident in that composite reliability values ranged from 0.748 to 0.897 (see Table 1). These values were all above Hair et al.'s [44] recommended threshold of 0.700. Next, convergent validity was estimated. Our result showed that average variance extracted values were all above Hair et al.'s [44] recommended threshold of 0.500. This, convergent validity was evident. As shown in Table 1, the average variance extracted values were greater than the between-construct correlations (squared). This provided evidence of discriminant validity.

Table 1. Measurement model results (n = 428).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	1.000										
(2)	0.584 ^a (0.341 ^b)	1.000									
(3)	0.470 (0.221)	0.453 (0.205)	1.000								
(4)	0.446 (0.199)	0.411 (0.169)	0.405 (0.164)	1.000							
(5)	0.445 (0.198)	0.428 (0.183)	0.353 (0.125)	0.428 (0.183)	1.000						
(6)	0.413 (0.171)	0.315 (0.099)	0.438 (0.192)	0.411 (0.169)	0.446 (0.199)	1.000					
(7)	0.388 (0.151)	0.385 (0.148)	0.440 (0.194)	0.385 (0.148)	0.369 (0.136)	0.629 (0.396)	1.000				
(8)	0.434 (0.188)	0.404 (0.163)	0.398 (0.158)	0.396 (0.157)	0.366 (0.134)	0.505 (0.255)	0.541 (0.293)	1.000			
(9)	0.394 (0.155)	0.388 (0.151)	0.378 (0.143)	0.493 (0.243)	0.346 (0.120)	0.387 (0.150)	0.402 (0.162)	0.470 (0.221)	1.000		
(10)	0.407 (0.166)	0.373 (0.139)	0.394 (0.155)	0.490 (0.240)	0.0551 (0.123)	0.419 (0.176)	0.384 (0.147)	0.360 (0.130)	0.582 (0.339)	1.000	
(11)	0.446 (0.199)	0.410 (0.168)	0.459 (0.211)	0.508 (0.258)	0.380 (0.144)	0.418 (0.175)	0.370 (0.137)	0.418 (0.175)	0.562 (0.316)	0.819 (0.671)	1.000
Mean (SD)	4.699 (1.041)	4.465 (1.157)	4.770 (1.072)	4.933 (1.136)	5.016 (1.267)	4.783 (1.174)	4.356 (1.179)	4.523 (1.072)	4.232 (1.226)	5.204 (1.269)	5.297 (1.229)
CR (AVE)	0.748 (0.501)	0.805 (0.582)	0.828 (0.616)	0.809 (0.585)	0.884 (0.793)	0.879 (0.708)	0.803 (0.671)	0.772 (0.532)	0.869 (0.689)	0.887 (0.798)	0.897 (0.814)

Note 1: (1) = local culture, (2) = local entertainments, (3) = local people, (4) = local natural environment, (5) = local superstructure, (6) = local food and dishes, (7) = local products, (8) = local accommodations, (9) = sense of belonging, (10) = revisit intention, (11) = word-of-mouth intention. Note 2: Goodness-of-fit statistics for the measurement model: $\chi^2 = 620.694$, $df = 322$, $\chi^2/df = 1.928$, $p < 0.001$, RMSEA = 0.047, CFI = 0.959, IFI = 0.948. ^a Correlations between variables, ^b Squared correlations.

4.2. Evaluation of the Higher-Order Framework and Modeling Comparison

Structural equation modeling was conducted. The maximum likelihood estimation approach was utilized. Results showed that the model had a satisfactory level of goodness-of-fit statistics ($\chi^2 = 912.632$, $df = 289$, $p < 0.001$, $\chi^2/df = 3.158$, $RMSEA = 0.071$, $CFI = 0.901$, $IFI = 0.902$, $TLI = 0.889$). The details regarding the structural equation modeling results are shown in Figure 1 and Table 2. Our result revealed that the higher-order latent factor is significantly and positively related to eight first-order constructs (1 = local culture, 2 = local entertainments, 3 = local people, 4 = local natural environment, 5 = local superstructure, 6 = local food and dishes, 7 = local products, 8 = local accommodations). The coefficients were 0.746 (1 = local culture), 0.662 (2 = local entertainments), 0.683 (3 = local people), 0.742 (4 = local natural environment), 0.624 (5 = local superstructure), 0.687 (6 = local food and dishes), 0.713 (7 = local products), and 0.703 (8 = local accommodations). Moreover, all associations were significant at $p < 0.01$. While the goodness-of-fit statistics of the first-order model ($\chi^2 = 548.556$, $df = 255$, $p < 0.001$, $\chi^2/df = 2.151$, $RMSEA = 0.052$, $CFI = 0.954$, $IFI = 0.954$, $TLI = 0.941$) were slightly better than the higher-order model, no independent variable among eight factors had a significant direct influence on revisit intention and word-of-mouth intention ($p < 0.05$). This finding demonstrated the adequacy of the higher-order framework of community-based tourism performance. The higher-order latent variable sufficiently account for the eight first-order factors of local culture ($R^2 = 0.557$), local entertainments ($R^2 = 0.438$), local people ($R^2 = 0.466$), local natural environment ($R^2 = 0.550$), local superstructure ($R^2 = 0.390$), local food and dishes ($R^2 = 0.472$), local products ($R^2 = 0.508$), and local accommodations ($R^2 = 0.495$).

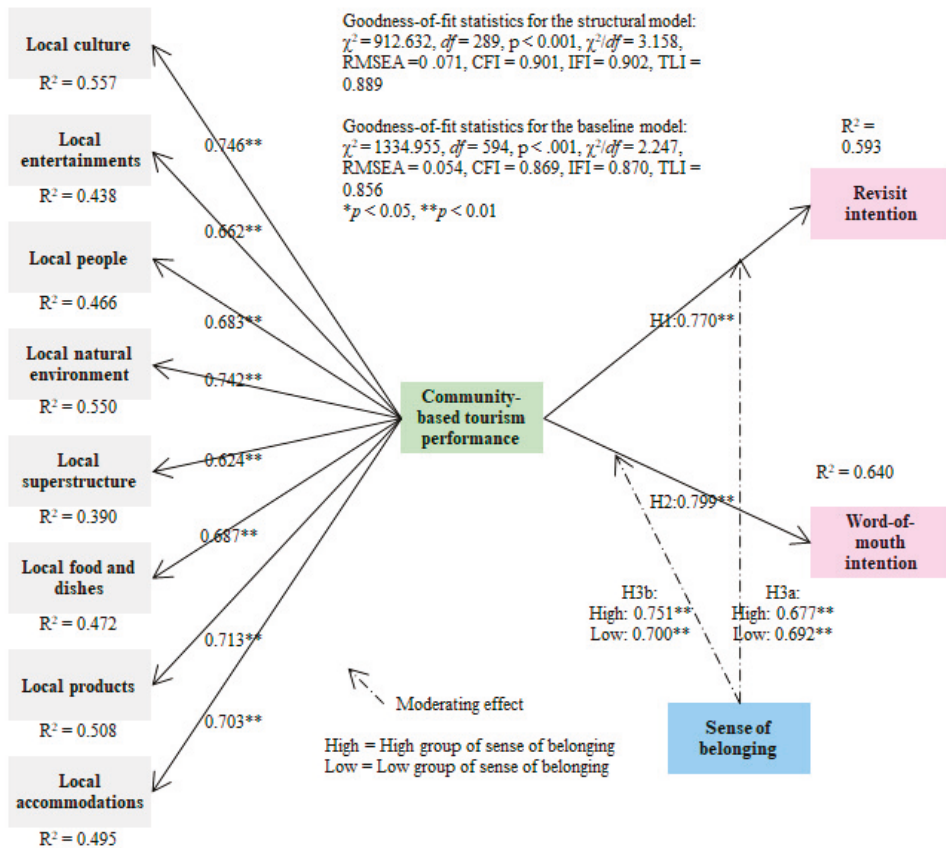


Figure 1. Results of the structural equation modeling (n = 428).

Table 2. Structural model assessment and hypotheses testing (n = 428)

Independent Variable	Dependent Variable	Standardized Estimate	t-Value
H1 Community-based tourism performance	→ Revisit intention	0.770	11.037 **
H2 Community-based tourism performance	→ Word-of-mouth intention	0.799	10.899 **
Goodness-of-fit statistics for the structural model: $\chi^2 = 912.632$, $df = 289$, $p < 0.001$, $\chi^2/df = 3.158$, RMSEA = 0.071, CFI = 0.901, IFI = 0.902, TLI = 0.889		Total variance explained (R^2): R^2 for revisit intention = 0.593 R^2 for word-of-mouth intention = 0.640 * $p < 0.05$, ** $p < 0.01$	

4.3. Test for the Hypothesized Relationships

The proposed effect of community-based tourism performance on behavioral intentions was evaluated. As reported in Figure 1 and Table 2, our results showed that community-based tourism performance exerted a significant influence on revisit intention ($\beta = 0.770$, $p < 0.01$) and word-of-mouth intention ($\beta = 0.799$, $p < 0.01$). Therefore, Hypotheses 1 and 2 were supported. About 59.3% of the total variance in revisit intention and about 64.0% of the variance in word-of-mouth intention was accounted for by the higher-order framework of community-based tourism performance, respectively. This result implies that boosting the community-based tourism performance is an essential requisite for the attainment of travelers’ strong intentions to revisit the community-based tourism destination and recommend the place to others

4.4. Test for Metric Invariance

The hypothesized moderating influence of sense of belonging was tested using a test for metric invariance. First, the responses were divided into high and low groups of sense of belonging by employing a K-means cluster analytical technique. The K-means findings determined a high group, which included 269 cases whereas the low group included 159 cases. A baseline model encompassing these high and low sense-of-belonging groups was then generated. As reported in Table 3 and Figure 1, the model contained an acceptable level of the goodness-of-fit statistics ($\chi^2 = 1334.955$, $df = 594$, $p < 0.001$, $\chi^2/df = 2.247$, RMSEA = 0.054, CFI = 0.869, IFI = 0.870, TLI = 0.856). Next, we made a comparison between the baseline model and nested models using a chi-square test. Within the nested models, a particular path of interest was restricted to be equal between high and low sense-of-belonging groups. As reported in Table 3, our result showed that the linkage between community-based tourism performance and revisit intention was not significantly difference across high and low sense-of-belonging groups ($\Delta\chi^2 [1] = 3.791$, $p > 0.05$). Therefore, Hypothesis 3a was not supported. However, as expected, the linkage between community-based tourism performance and word-of-mouth intention differed significantly between high and low groups ($\Delta\chi^2 [1] = 4.268$, $p < 0.05$). This result supported Hypothesis 3b. That is, sense of belonging significantly moderated the path from community-based tourism performance to word-of-mouth intention.

Table 3. Structural invariance model results

Paths	High Group of Sense of Belonging (n = 269)		Low Group of Sense of Belonging (n = 159)		Baseline Model (Freely Estimated)	Nested Model (Constrained to Be Equal)
	Coefficients	t-Values	Coefficients	t-Values		
CBT perf. → Revisit intention	0.677	8.003 **	0.692	5.990 **	$\chi^2 (594) = 1334.955$	$\chi^2 (595) = 1338.746^a$
CBT perf. → WOM intention	0.751	6.139 **	0.700	7.787 **	$\chi^2 (594) = 1334.955$	$\chi^2 (595) = 1339.223^b$
Chi-square difference test:					Goodness-of-fit statistics for the baseline model:	
^a $\Delta\chi^2 (1) = 3.791$, $p > 0.05$ (insignificant) (H3a was not supported)					$\chi^2 = 1334.955$, $df = 594$, $p < 0.001$, $\chi^2/df = 2.247$, RMSEA = 0.054,	
^b $\Delta\chi^2 (1) = 4.268$, $p < 0.05$ (significant) (H3b was supported)					CFI = 0.869, IFI = 0.870, TLI = 0.856	
					* $p < 0.05$, ** $p < 0.01$	

5. Discussion

This research provides a strong theorization related to travelers' perceptions of community-based tourism performance in explicating their post-purchase decision formation. The present research was one of the few studies that considers the moderating influence of sense of belonging on such decision-making process in the sustainable tourism sector. Findings of the present study help comprehend the community-based tourism advancement and its role better, which ultimately leads to achieving the intentions to revisit the community-based tourism destination and to spread positive word-of-mouth for the destination. In addition, the study provides a clearer understanding of the critical function of the sense of belonging and its active role in the formation of behavioral intentions as a moderator. Given that boosting visitors' favorable post-purchase decisions/behaviors is one of the essential requisites for the successful sustainable destination development under the competitive market environment, the study finding is of utmost importance in helping community-based tourism practitioners develop the means of increasing the retention rate and enhancing the diverse forms of recommendation behaviors.

A specific valuable and important point regarding the framework of community-based tourism performance is its higher-order structure. It was apparent that the eight first-order variables (1 = local culture, 2 = local entertainments, 3 = local people, 4 = local natural environment, 5 = local superstructure, 6 = local food and dishes, 7 = local products, 8 = local accommodations) significantly belong to one higher-order concept of community-based tourism performance. The higher-order global factor sufficiently extracted the commonality underlying the first-order variables. From a theoretical point of view, this result enriched the community-based tourism literature by providing a hierarchical

approach, which clearly captures the performance of community-based tourism. This result helps destination researchers more concisely theorize such an intricate concept in the community-based tourism context. From a practical point of view, the strength of the relationships between the global latent factor and the eight first-order factors was all high. In addition, the explanatory power of the higher-order factor for each first-order variable was strong. Hence, dealing with and enhancing the performance of local culture, local entertainments, local people, local natural environment, local superstructure, local food, local products, and local accommodations are crucial to fulfill the vital aspects of visitors' needs and wants when traveling to a community-based tourism destination.

It has been recognized that community-based tourism is ultimately an efficient means of increasing the sustainability of the socio-ecosystem, reviving local traditions, conserving natural resources, reducing poverty, and exhibiting/respecting local culture in the community [15,22]. Beyond these contributions of community-based tourism, the present research successfully linked it to traveler post-purchase decisions. Indeed, our empirical result supported the significant linkage between community-based tourism performance and behavioral intentions. The effective ways of enhancing the number of visitors in a community-based tourism destination is weakly known. Utilizing the quantitative approach, this research successfully demonstrated that community-based tourism performance and its attributes are critical sources for destination practitioners when inventing efficient tactics about how to retain visitors and eliciting their positive word-of-mouth activities about the destination.

It was revealed that travelers' sense of belonging to a community-based tourism destination moderates the relationship between community-based tourism performance and word-of-mouth intention. In particular, the association was stronger in the high sense of belonging group ($\beta = 0.751$, $p < 0.01$) than in the low group ($\beta = 0.700$, $p < 0.01$). This result implies that travelers' perception of community-based tourism performance more likely results in word-of-mouth intention when their sense-of-belonging level for the destination is high. Our finding provides important theoretical information that the magnitude of the relationship strength between community-based tourism performance and intention relationship is determined on the basis of sense-of-belonging level. In order to obtain a deeper understanding of the role of sense of belonging, tourism academics should recognize its moderating nature. Regarding the practical aspect, our result offered crucial insights. The finding informed practitioners in the community-based tourism destination that they should make various efforts to strengthen the affective bonding between the destination and its visitors. As evidenced in this study, at a similar perception level regarding the performance of the community-based tourism destination, travelers more actively engage in diverse forms of word-of-mouth behaviors especially when they feel strongly connected to the destination.

As intensively studied by Álvarez-García, Durán-Sánchez, and del Río-Rama [45], a tremendous number of studies on community-based tourism has been gradually increased in the past few years. This notable concerns by a few scholars is related to the focal role of community-based tourism to enhance the quality of life for the local community [45]. Nonetheless, it is quite axiomatic that it would be difficult for any business to be sustained without consistent purchase of consumers. Such a concept is also applied to various range of tourism and sustainable development. In this sense, a study that comprehends the revisit and word-of-mouth intentions can be significant. Communities should consider the tourists' behaviors to sustain the community benefits through the profit of tourists or mutual benefits. In other words, endeavors to understand the tourists who visit their communities need to be vigorous in order to support the core goal the community tourism initiatives.

Finally, one particular interesting result from data collection is that about 70% of respondents declared that their travel purposes were for relaxation. This concentrated outcome may represent the characteristic of Korean tourists who visit CBT places. As known, South Korea's working environment is extremely stressful. Average working hours and suicide rate in South Korea have been frequently ranked first or second among OECD nations [46,47]. In this regard, Korean tourists may have deep desires to have relaxation time even though they had visited a CBT destination to experience a local social environment away from home. Besides, lots of Korean CBT destinations are located in rural areas which has highly

motivated Korean local authorities to develop rural places as CBT destinations on purpose. For instance, TourDure is the government support program of CBT initiative in Korea. Most of the TourDure programs and products are in rural areas in which are good places to relax in nature. Given that general Korean people have lots of stress due to hard working conditions, living mostly in metropolitan areas (about half population), most of the tourists might desire to have a good rest during their vacation for CBT. In this sense, organizations or markers for CBT in Korea may consider relaxation as a marketing strategy and plan in order to meet visitors' needs

6. Conclusions

Sustainable tourism is a steadily growing phenomenon in the global tourism industry. Community-based tourism is one of the core facets of sustainable tourism development in destinations. Moving beyond the extant conceptualization, the present research was an important attempt to build a framework linking the higher-order structure of community-based tourism comprising eight first-order factors and behavioral intentions by taking into account the moderating impact of a sense of belonging. In closing, taking us one step further toward comprehending the role of these concepts, the proposed theorization was wholly supported. This study had several limitations that provide insightful points for future studies. First, while most correlations are under the problematic level, several inter-correlations are somewhat high. This implies that the results of this study are not entirely away from the multi-collinearity issue. For future research, a more thorough measurement design is highly recommended. Researchers also might investigate such measurements design using different analytical methods such as SEM using partial least square [48]. Second, previous studies in sustainable tourism asserted the importance of some mediators that clearly explained travelers' sustainable decision-making process and behaviors (e.g., satisfaction, emotions, commitment) [1,40,49]. Yet, the present research did not include such crucial mediators that possibly maximize the effect of independent variables on the outcome variables. Future scholars are advised to extend the proposed conceptual framework by incorporating such mediators. This effort would help to increase the prediction power of the proposed model and provide a valuable explanation for travelers' behavioral intentions in sustainable tourism development.

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Appendix A

Local culture

- I had the opportunity to experience various local ways of life.
- I think that programs offered at the CBT destination were rich in history for the locals.
- The chance to try/experience local foods/beverages in the CBT destination was sufficient (e.g., makgeolli, pajeon).

Local entertainments

- I participated in unique activities at the CBT destination that I cannot usually experience in everyday life.
- There were interesting, special events at the CBT destination.
- At the CBT destination, I joined festivals and events that I was interested in.

Local people

- Local people at the CBT destination were friendly/kind.
 - Local people at the CBT destination showed a good willingness to help me/us.
 - Local people at the CBT destination showed a good willingness to share information about the destination/history/culture.
-

Local natural environment

- The natural environment at the CBT destination was appealing.
- The CBT destination was well preserved.
- The landscape at the CBT destination was awe-inspiring.

Local superstructure

- The architecture at the CBT destination was unique.
- The buildings at the CBT destination were interesting.

Local food and dishes

- At the CBT destination, the quality of foods/services in the restaurants was good.
- I experienced a good quality of local dishes in restaurants at the CBT destination.
- I experienced a variety of dishes/brands in the local restaurants at the CBT destination.

Local product

- I experienced a guaranteed quality of products/services in shopping centers at the CBT destination.
- At the CBT destination, the quality of local products in shopping centers was nice.
- In the CBT destination, I experienced a variety of products/brands in local shops.

Local accommodation

- I experienced a guaranteed quality of accommodation at the CBT destination.
- At the CBT destination, I didn't experience a high quality of nature in the place of accommodation.
- I experienced a good quality of local life in the place of accommodation at the CBT destination.

Revisit intention

- I will make an effort to experience the CBT destination again in the near future.
- I plan to experience the CBT destination again in the near future.

Word-of-mouth intention

- I encourage my friends and relatives to experience the CBT destination.
- If someone is looking for a tour program, I generally advise him/her to experience the CBT destination.

Sense of belonging

- I felt a strong sense of belonging to the CBT destination and its settings/facilities. I experienced a good quality of local dishes in restaurants at the CBT destination.
 - I was very attached to the CBT destination.
 - The CBT destination meant a lot to me.
-

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Article

Assessing Tourists' Preferences of Negative Externalities of Environmental Management Programs: A Case Study on Invasive Species in Shei-Pa National Park, Taiwan

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Abstract: This study uses discrete choice experiments to evaluate and reduce the environmental impact of negative externalities of managing invasive alien species (IAS), such as “ecological shock”, “health risk”, “waiting time” “tour range” and “prevention and control fee”, on the support of IAS prevention and control. We used data from Taiwan’s Shei-Pa National Park and its visitors for the case study and obtained 602 valid questionnaires. The results indicate that visitors consider that each unit of externality of IAS prevention and control measures significantly reduces their utility, and the magnitude equals the estimated value of externality. However, although negative externalities are inevitable, the support for IAS prevention and control measures could be maximized by adjusting the types and proportions of negative externalities. For example, visitors are willing to sacrifice up to 1.41% of the tour range in exchange for a 1% reduction in ecological shock. This study summarizes the negative externalities of IAS prevention and control measures and proposes to adjust the combination of negative externalities to reduce the shocks of those IAS prevention and control measures on the public, so as to increase the public support for IAS policies and increase the sustainability of tourism.

Keywords: discrete choice experiments; invasive species control; tourists’ preferences; two stage on-site sampling; negative externalities

1. Introduction

National parks (NPs) not only bear the important responsibility of protecting key eco-environments and landscapes but also must meet the needs of public sightseeing and recreation. The various sustainability objectives of NPs are occasionally compatible but may also conflict with one another [1]. Such conflicts are particularly obvious in the prevention and control of invasive alien species (IASs). Because IASs can spread by attaching themselves to the human body, clothing, vehicles, and recreational equipment, the greater that the number of tourists who visit NPs is, the greater the probability that the NPs will be impacted and the higher the severity of the impact [2–6]. Once it enters an NP, an IAS may change the characteristics of the park ecosystem, compete with local species for food, cause local species to disappear, and change the landscape. This problem worsens with the increase in the number of NP tourists. IAS prevention and control is therefore regarded as the largest challenge facing NP management [7,8].

The impact of IASs on sustainability of NPs has been documented. For example, the cinnamon fungus caused a large area of forest blight in Brisbane Ranges NP in Australia and a decrease in its vegetation coverage rate [9]. The mile-a-minute weed reduced the plant richness of the Chitwan NP in Nepal [10]. The Burmese python caused a significant reduction in the number of mammals and birds

in Everglades NP [11]. IASs not only severely damage the ecology and landscape of NPs, they also harm other IASs. For example, in America's Hawaii Volcanoes National Park, the firebush gradually replaced the endemic plant ohia [12] while promoting the expansion of the leafhopper population, another IAS [13], and the subsequent apoptosis of native plants. These cases show that IASs pose a serious threat to the precious biodiversity of NPs and change the original landscape. Therefore, many NPs seek to actively controlled and manage IASs [14,15]. However, these NPs often find themselves in a unique dilemma in regard to preventing and controlling IASs.

The first challenge to NPs in the prevention and control of IASs is that the prevention and control measures often endanger other species and the ecology in NPs. The Booderee NP's approach to controlling the bitou bush reduced the number of bird species in the park [16]. Capitol Reef NP's efforts to control the codling moth also reduced alfalfa leafcutting bee's nectar, which in turn threatened several species of endangered plants in the park [17]. Measures taken by Queensland Conservation Reserve to control para grass resulted in a decrease in the abundance of amphibians and reptiles, such as skinks and frogs, in the park [18]. Antioch Dunes National Wildlife Refuge applied chemical agents to inhibit rigput brome only to drastically reduce the hatchability of Lange's metalmark butterfly, an internationally endangered species [19]. Therefore, in preventing and controlling IASs, NPs must understand potential side effects (i.e., negative externalities) and choose the most appropriate approach [18].

Sightseeing and recreational activities are another challenge to NPs in preventing and controlling IASs. This challenge originates in the fact that tourists are a medium of IAS proliferation. Thus, IAS prevention measures can impinge on tourist sightseeing and recreation activities. Therefore, NP business management confronts conflicting objectives: providing sightseeing opportunities and preventing IAS proliferation. Many studies confirm that tourists contribute to IAS proliferation. Lonsdale and Lane [20] investigated IASs attached to tourist vehicles in Kakadu NP. They collected 1960 seeds from 304 vehicles and found that one vehicle alone carried 789 seeds belonging to 15 plants. Research by Whinam, et al. [21] on tourists at the Macquarie Island Nature Reserve produced similar findings. An investigation of the clothing, belongings, and travel equipment of 64 visitors found 981 seeds belonging to 15 families and 90 plants. The cited studies confirm that tourists are a medium by which IASs enter NPs. Therefore, the more tourists that there are, the higher the risk of NPs being impacted by IASs. In terms of managing the IAS impact, NPs face two conflicting management objectives: reducing IAS risk and maintaining normal sightseeing and recreational activities.

Preventing and controlling IASs can negatively impact tourists in many ways. For example, the ecological impact of IAS prevention and control can reduce the quality of tourist recreation [22]. Chemicals used to prevent and control IASs are harmful to tourist health [23]. Closing controlled areas reduces the available recreational area. An IAS inspection prior to entrance into the park delays tourists. All these examples represent negative externalities of IAS prevention and control. Such externalities decrease tourist recreational satisfaction with NPs, which pressures NP managers to adopt corrective measures [24,25]. However, if an NP repeatedly modifies its IAS prevention and control strategy in response to tourist complaints, it may compromise the efficiency of the strategy and aggravate the IAS problem. Therefore, when planning measures to prevent and control IASs, NPs must carefully consider any negative externalities and tourist comments on such externalities. Currently, there is a lack of research on the preferences of NPs tourists regarding the negative externalities associated with IAS prevention and control. A detailed analysis of NP tourist preferences regarding the negative externalities of NP IAS prevention and control would help NPs evaluate tourist responses to the trade-offs between the externalities and the tourists' willing-to-pay price. Then, based on the trade-offs and the willing-to-pay price, prevention and control measures could be designed that have the least impact on tourists (which represents the tourists' first preference). With the help of such an analysis, NPs could avoid the conflict between tourist recreational demands and IAS prevention and control.

To close the previously noted research gap, this study investigates the trade-offs between NP tourists and the externalities of IAS prevention and control measures. Taiwan's Shei-Pa National

Park is chosen as the research focus. The following section explains the measures adopted to prevent and control IASs and generalizes the externalities of the measures for use in an attributes-of-choice experiment. This study's most important contribution is its focus on the negative externalities of IAS prevention and control measures. The results of this study reflect our effort to consider both the need for NPs to prevent and control IASs and their dependence of the support of NP tourists.

2. Overview of Shei-Pa NP, Taiwan

Shei-Pa NP is a mountain-type NP features glacial landforms, ice-age relict species, unique landscapes and aboriginal culture. There is an ice-age relict species called the Formosan land-locked salmon (*Oncorhynchus masou formosanus*), an endemic subspecies of Taiwan, which proves the impacts of the glaciation process and the uplifting of mountain ranges on Taiwan. It is a miraculous and major discovery of biogeography. The main peak of Snow Mountain, a height of 3886 m, is the highest point in the NP and the second-highest peak in Taiwan. Mount Dabajian, 3492 m above sea level, has a sharp and steep shape and is surrounded by rugged terrain and cliffs. It is the core area of the Atayal native tribe and the birthplace of the ancestors of the Saisiyat native tribe. Those fragile and rare ecological and cultural features of Shei-Pa NP attract a large number of visitors. How to balance conservation demands and recreational impacts is a major challenge in the management of Shei-Pa NP, and the IAS issue is a top priority.

The management office of the Shei-Pa NP once investigated the IAS in the park. The research found a total of 65 species of invasive plants, which could be categorized into 21 families and 48 genera, accounting for about a quarter of invasive plants in Taiwan. In terms of the proportion of IAS to native plants of Taiwan, the percentage for Shei-Pa NP was 20%, much higher than the 6% for the rest of Taiwan. As visitors and hikers come and go, these IAS plants are likely to invade precious and rare habitats. For example, IAS plants have already spread to the Formosan land-locked salmon's habitat, where they have become dominant plants, which could impact the recovery of this endangered species. Exotic wildcats in the area prey on the protected green-backed tit (*Parus monticolus*), plumbeous water redstart (*Phoenicurus fuliginosus*) and Formosan shrew (*Episoriculus fumidus*). The exotic red-billed blue magpie (*Urocissa erythrorhyncha*) is observed to nest and feed together with the blue magpie (*Urocissa caerulea*), an endemic species in Taiwan. This behavior indicates that the two might hybridize, causing genetic pollution problems. These phenomena reflect the problem that IAS are invading Shei-Pa NP, which should be taken seriously.

3. Data and Methodology

3.1. Negative Externalities of IAS Prevention and Control Measures and Questionnaire Design, Attributes and Levels

To study the public preference for negative externalities of IAS prevention and control using the choice experiment method, the first step is to develop the attributes and levels of the questionnaires. In terms of the topic of negative externalities of IAS prevention and control, items to be considered include the target species to be prevented and controlled, control methods applicable to the target species, the characteristics of the ecosystem of the target species, cost, side effects and so on. The actual prevention and control plan is the result of multi-party assessment and is highly professional and technical. As far as surveys for public opinions are concerned, such information must be presented. However, it is impossible to present all the information combinations in the questionnaires. Moreover, the public likely cannot fully understand professional and technical information. Information combination, along with professional and technical issues, pose the most difficult obstacles to this research.

Professional and technical information should be assessed by professionals, but the opinions of the public should not be neglected. Therefore, we rely on both literature review and focus groups to arrive at a solution. We arranged three focus group discussions. Each time, there were six people, of whom two are IAS prevention and control professionals and the other four are not. With reference to

the IUCN's top 100 IAS directory, we collect and summarize the target species, control and prevention methods applicable to target species, characteristics of the ecosystem of the target species, cost, and side effects as materials for the discussion of focus groups. The conclusions of the focus groups include the following: (1) conducting research on each target species one by one is too slow and not affordable; (2) the prevention and control measures are highly professional and technical, making them difficult for the public to understand, and they should be evaluated and planned by professionals; and (3) what the public is concerned about is the impact of those prevention and control measures. It is therefore recommended to assess the externalities of the control and prevention measures, rather than evaluating specific target species (e.g., RIFA) or specific methods of control (e.g., pesticides).

Based on the results of the focus groups and literature review, and considering the characteristics of the Shei-Pa NP, we summarize four negative externalities (or the so-called attributes in the choice experiment method) of the IAS prevention and control measures for visitors of NPs, including "the intensity of the impact of the prevention and control on the ecosystem", "recreational or visiting range reduced by those measures", "the possibility that visitors' health is negatively affected by the measures", and "waiting time of visitors caused by the implementation of the measures". We also determine the intensity of the four externalities (the so-called levels in the choice experiment method). Below are the explanations of the content and meaning of those attributes and levels.

1. The intensity of the impact of the prevention and control on the ecosystem (ecological shocks)

Biodiversity is an important factor that attracts visitors to NPs [22]. However, IAS prevention and control measures could cause serious negative impacts on the biodiversity of the treated areas, therefore reducing the utility of visitors in recreational activities. For a sense of the impact of IAS prevention and control measures on NPs' ecosystem, see the case studies of Booderee NP [16], Capitol Reef NP [17], the Queensland conservation reserve [18], and the Antioch Dunes National Wildlife Refuge [19]. Among those, Stark et al. (2012) estimated that the impact of IAS measures on the number of affected groups reached 30%. According to the research of Stark, et al. [19], and based on the suggestion of Ryan, et al. [26] that each level of the attribute should be 15% higher or lower than the baseline value or the previous level, we divide the intensity of the impact of the prevention and control on ecosystem to five levels at 0%, 15%, 30%, 45%, and 60%.

2. Recreational or visiting range reduced by those measures (tour range)

IAS prevention and control measures would affect the range of visitors' activities. For example, after applying chemicals in the IAS prevention areas, the areas would be closed to prevent visitors from coming into contact with those chemicals. When using manual labor and chain saws, the affected areas should be closed for the work. Tourist activities are often prohibited around the monitored facilities to avoid interference. However, there might be antagonism toward partial closure of some NP areas [27]. Therefore, limitation of the scope of visitors' recreational activities caused by the implementation of the prevention and control measure of IAS is also one of the externalities of those measures. This attribute is expressed as the percentage of reduced recreational or visiting range and is set at 0%, 20%, 40%, 60% and 80%.

3. The possibility that visitors' health is negatively affected by the measures (health risk)

IAS prevention and control measures include the use of chemicals, but chemical agents could affect human health and cause diseases [23]. Using chemical methods for prevention and control in recreational areas might affect the health of visitors, which is one of the negative externalities of prevention and control measures. Currently, there is no relevant literature that provides specific and empirical data on the level of negative impacts of IAS chemical prevention and control on visitors' health. We assume probability values of each level at 0%, 30%, 60% and 90%.

4. Waiting time of visitors caused by the implementation of the measures (waiting time)

Because visitors cherish travel time [28], delay or waiting time would reduce their utility. Therefore, when the implementation of IAS prevention and control measures in NPs causes delay, it becomes an externality of IAS prevention and control measures. According to LeDoux and Martin [29], those measures would cost each visitor approximately 15–20 min. This research sets the attribute of levels of visitors’ waiting time at 0, 20, 40 and 60 min.

To assess the willingness to pay for the various attributes of the externalities of the IAS prevention and control measures, we establish the attribute of “additional and special fee for prevention and control collected at the entrance of attractions or parks”.

5. Additional and special fee for prevention and control collected at the entrance of attractions or parks (prevention and control fee)

Based on the research of Adams, et al. [30] on Florida residents’ willingness to pay for access to state parks, the fee levels are set at 40 NTD, 80 NTD, 120 NTD, 160 NTD, and 200 NTD, with a 120 NTD baseline.

After determining the attributes and levels, we use the orthogonal design methods to generate alternatives and obtain a total of 25 alternatives. Then, we divide these 25 alternatives into groups of 5, and each group is called a scenario. Furthermore, to avoid the condition in which none of the 5 alternatives are accepted by respondents but they are required to make a choice, we add a “status quo” option to each scenario [31]. Thus, each questionnaire has 5 scenarios and each scenario has 6 alternatives.

3.2. Econometrics Analysis

We use the random utility maximization model to analyze the data. In this model, the utility of respondent when choosing alternative i could be represented by the following formula:

$$U_{in} = V_{in} + \varepsilon_{in}, \forall i \in C_n \tag{1}$$

U_{in} is the utility of respondent n with alternative i , and C_n is the set of all available choices to respondent n . Because actual utility of the respondent could not be observed, we use V_{in} to represent observable items and a random variable ε_{in} for unobservable items. If ε_{in} is i.i.d. with type 1 extreme value distribution (i.e., McFadden’s conditional logit model), the probability of respondent n choosing alternative i could be represented by Formula (2):

$$P_{in} = \frac{\exp(\mu V_{in})}{\sum_{j \in C} \exp(\mu V_{jn})} \tag{2}$$

In addition, we establish the linear function with the attribute of V_{in} as in Formula (3):

$$V_{in} = ASC_i + \beta_1 X_{i1} \dots + \beta_K X_{iK} \tag{3}$$

β_K is the coefficient of attribute K . X_{iK} represents attribute K of alternative i chosen by the respondent. Alternative-specific constant (ASC) is an indicator variable, showing whether the corresponding option is selected or not. Its estimated value shows the function that other attributes could not represent or the utility of the “status quo” [32]. If ASC is positive, it means that respondent prefers “status quo” to any other alternatives. Choosing another alternative would lower utility; therefore, the respondent chooses “status quo” and vice versa.

With the above assumptions, the marginal rate of substitution of each pair of attributes is represented by Formula (4):

$$MRS_{SK} = -\frac{\beta_K}{\beta_S} \tag{4}$$

If the price attribute is β_S , the estimation of Formula (4) is the willingness to pay for β_K .

This research conducted a questionnaire survey in Shei-Pa NP from March to November 2014. We used two-stage sampling to select the time and respondents of the survey. First, a stratified random sampling method was used to choose the survey time, and then, the systematic sampling method was used to obtain the samples. In this research, 4 survey months were randomly selected out of 12, specifically, March, July, August, and November. Then, the date of the survey was randomly selected for each month. On the day of the survey, we selected a number, sorted as the date of the day, between 0 and 9, from the random number table. On the same day, the visitor who passed the questionnaire distribution point in the order of the selected number became the first respondent. After that, three was used as the sampling unit, i.e., every third person who passed the questionnaire distribution point would be the next respondent. By randomly selecting the survey time and the initial respondent, we obtained the samples required by random sampling. A total of 692 people were surveyed, and 81 refused, making the rate of rejection 8.54%. In the end, a total of 611 questionnaires were recovered. Among them, 9 were invalid, and 602 were valid, making the effective return ratio 98.5%. Each respondent was required to answer questions regarding 5 scenarios. However, some of them did not complete all the scenarios, reducing the number of analyzable scenarios to 2998.

4. Results

The estimates of all attribute parameters are negative and statistically significant (Table 1), indicating that visitors believe that the externalities of IAS prevention and control measures significantly reduce their utility. The more the utility falls, the more difficult it is for the corresponding IAS prevention and control measure to get visitors' support. Using Formula (4), we calculate the willingness to pay of visitors for the negative externalities of IAS prevention and control measures (Table 1). The least preferred side effects are "ecological shock", followed by "health risk", "waiting time", and "tour range", and the last is the "prevention and control fee". These results reveal that the antipathy caused per unit of "ecological shock" is higher than that for any other types of externalities per unit. The utility of "none of the above" is -1.8732 , indicating that visitors believe that the utility of IAS prevention and control is higher than not having such prevention and control. These results respond to research purposes (1) and (4). Specifically, the public's willingness to pay for the IAS prevention and control measures is positive. Negative externalities of IAS prevention and control reduce the welfare of the public and reduce the support for IAS prevention and control measures. However, the proportion of various negative externalities could be adjusted following the results related to research purposes (2) and (3). Although negative externalities are unavoidable, visitors' support of IAS prevention and control measures could still be maximized.

MWTP was calculated based on parameter estimates of Equation (4).

Detailed parameter estimates of various externalities and willingness to pay are as below. "Ecological shock" is estimated to be -0.014 , indicating that it would reduce visitors' utility. Conversely, when ecological shock declines by 1%, visitors' welfare would increase by 9.3 NTD. In other words, visitors are willing to pay 9.3 NTD to reduce 1% of ecological shock. "Tour range" is -0.0099 , showing that reduced visiting range would lower visitors' utility. In terms of willingness to pay, a 1% reduction of visiting range caused by prevention and control equals an increase in visitors' welfare of 6.6 NTD. The estimate for "health risk" is -0.0109 , indicating that the impact of prevention and control on the health of visitors would reduce their utility. A decline of 1% of health risk from prevention and control would increase visitors' welfare by 7.3 NTD. The value for waiting time is -0.0107 , meaning that waiting would reduce visitors' utility. Saving 1 min of waiting time could increase visitors' welfare by 7.1 NTD. The estimate for "prevention and control fee" is -0.0015 , which is smaller than those of other attributes and indicates that visitors are less inclined to other negative externalities caused by IAS prevention and control and are willing to pay to reduce these negative externalities.

Table 1. Estimation results.

Attributes	Coefficient	MWTP
ASC	−1.8732 *** 0.0846	
Ecological Shocks	−0.014 *** 0.00107	−9.3
Tour Range	−0.0099 ** 0.00082	−6.6
Health Risk	−0.0109 *** 0.0007	−7.3
Waiting Time	−0.0107 ** 0.00104	−7.1
Prevention and Control Fee	−0.0015 * 0.0004	
Observations	2998	
Log-Likelihood	−5034	
AIC	10,080	

Note: * $p < 0.05$, ** $p < 0.025$, *** $p < 0.01$.

These results provide detailed guidelines for improving visitors' acceptance of IAS prevention and control. For example, estimates for "ecological shock" and "tour range" are -0.014 and -0.0099 , respectively, showing that visitors are more willing to exchange reduced recreational range for lower ecological shock. Specifically, visitors are willing to sacrifice up to 1.41% tour range for a 1% reduction in ecological shock. Therefore, if limiting the tour range could help the NP management carry out IAS prevention and control measures more easily and use methods with less ecological shock, visitors would still support the measures even if their tour range is reduced.

The estimate for "health risk" is -0.0109 , which has a 1-to-1 ratio with "tour range". This result shows that visitors are willing to sacrifice recreational area to reduce the likelihood of health risks. They are willing to sacrifice up to 1.1% of tour range for a 1% decline in health risk. Expanding the quarantine area could reduce visitors' contact with materials used for IAS prevention and control and avoid any harms to them. The larger the restricted area, the lower the health risk. From the perspective of visitors, the acceptable scope of quarantine could not be expanded indefinitely or even up to the closure of NP. It all depends on the potential health risk. They are willing to accept at most a 1.1% reduction in recreational area for a 1% drop in health risk.

The absolute value of the estimate of "ecological shock" is higher than that of "health risk", showing that visitors are more concerned about the ecological impact of IAS prevention and control than about their own health. The ratio of the two is 1.28, indicating that visitors could accept a higher risk to health, but they are willing to take up to 1.28% more health risk to reduce 1% of ecological impact in the face of an IAS prevention and control measure with lower ecological shock.

The estimate of "waiting time" is similar to "health risk". Its ratio (trade-off) with other externalities of IAS prevention and control measures is also similar to that of "health risk", and so is the interpretation of the meaning of the estimates.

5. Discussion

The results show that there are negative externalities associated with IAS prevention and control measures, which are unwanted because they reduce the utility of the public. However, though negative externalities are unavoidable, visitors' support of IAS prevention and control measures could still be maximized by adjusting the proportions of various types of negative externalities.

The conclusion of this research agrees with previous literature that IAS prevention and control is supported by the research results. The study of Rolfe and Windle (2014) on the willingness to pay of residents of Brisbane, Australia for RIFA prevention found a negative ASC, indicating that respondents were prone to choosing IAS prevention and control. That result is similar to our ASC estimate. Adams et al. (2011) studied Florida residents' willingness to pay for accessing state parks and concluded that each visitor was willing to pay an average of \$5.41 to reduce the coverage of exotic invasive plants. The estimate of biodiversity was positive, which meant that the decline in biodiversity caused by IAS prevention and control would decrease visitors' utility. Their result conforms to our negative estimate of "ecological shock". Our estimate of "tour range" is negative, indicating that limiting visitors' recreational area for IAS prevention would reduce their utility. This result is in line with the conclusion of Beville et al. (2012) that closing recreational fishing areas would lower utility.

This research also proposes several elements that have not been studied by previous research but are more in line with the needs of NPs for the prevention and control of IAS. We obtain visitors' preference for various negative externalities of IAS prevention and control measures and their willingness to pay to avoid those externalities. Based on those results, NPs could analyze whether IAS prevention and control conform to visitors' trade-offs of various negative externalities so that they may choose the plan that maximizes visitors' welfare. Our results are more specific, more in line with the needs of NPs in the actual planning of IAS prevention and control measures and consider the utility of visitors of NPs.

This study finds that respondents prefer IAS prevention and control, low ecological impact and no reduction in tour range. Those findings agree with the conclusions of the studies by Rolfe and Windle (2014), Adams et al. (2011), and Beville et al. (2012). However, this study goes further by exploring the trade-offs of those variables. Specifically, visitors would like to exchange a 1.4% reduction in tour range for a 1% decrease in ecological impact. Compared with previous research, these findings better answer the needs of the actual planning of IAS prevention and control. NPs preserve important ecological and cultural landscapes and are popular tourist attractions. However, IAS seriously interrupts the operations and management of NPs and create a unique dilemma. To solve this problem, this paper proposes two approaches, a focus on the externalities of IAS prevention and control and the evaluation of the public's trade-offs of various externalities in IAS prevention and control. The first advocates that the NPs' management must carefully consider the externalities of the prevention and control measures before making any choices. From the perspective of visitors, the second evaluates visitors' trade-offs of various negative externalities associated with the measures, so as to provide a basis for NPs to make decisions and choose the IAS prevention and control measures that have least impact on visitors (maximum utility) and are most supported by visitors.

6. Conclusions and Policy Suggestions

This paper uses the choice experiment method to study the preference of visitors of NPs for negative externalities in IAS prevention and control measures and selects visitors to Shei-Pa NP as the research objects. The topic of this research is the negative externalities of IAS prevention and control measures, which have not yet been fully discussed by academia. Moreover, there is scarcely any research on the public preference (trade-off) for those negative externalities. Therefore, the research topic of this paper is highly innovative. Our research uses a stratified random sampling method to decide the time of the onsite questionnaire survey. By combining random selection of the first and the last samples and systematic sampling in the onsite survey, we increase the randomness of respondents' chances of being selected. Because those methods are rarely used, they could serve as a reference for other onsite survey research studies.

The study shows that visitors prefer IAS prevention and control more so than not. They care most about the measures' impact on ecological environment, followed by personal health risk, waiting time and, finally, reduced recreational area. The estimate of ASC tells us whether visitors support IAS prevention and control measures. A negative ASC indicates that the utility of choosing "none of the above" is lower than that of any prevention and control measure. Thus, we could conclude that

visitors prefer the prevention and control of IAS. In terms of visitors' willingness to pay for negative externalities of IAS prevention and control measures, they are willing to pay 9.3 NTD for a 1% reduction in ecological shock, 7.3 NTD for a 1% decrease in health risk, 7.1 NTD for 1 min less waiting time, and 6.6 NTD for a 1% reduction in tour range. Decreasing any negative externalities of IAS prevention and control measures could improve visitors' welfare. Prevention and control measures that conform to the trade-off relationship between various externalities are those that could maximize visitors' welfare.

This study contributes to both empirical application and academic research. Although it is a case study of Taiwan's Shei-Pa NP, its findings are consistent with previous studies, meaning that the findings of this research are generalizable and can serve as reference for other NPs that are planning IAS prevention and control. Additionally, the methods used in this study, such as trade-off relations between various negative externalities of IAS prevention and control measures, are not seen in previous research but could better address the needs of IAS prevention and control. The onsite random sampling method could provide reference for other studies using onsite surveys to improve the randomness of sampling and the efficiency of statistical analysis.

Although the research objects of this study are Taiwan's Shei-Pa NP and its visitors, its findings could provide reference for other areas that are under IAS prevention and control. Attributes used in this study are not unique or exclusive to the Taiwan Shei-Pa NP. Instead, they are collected and summarized from case studies and research findings around the world. They are common in various settings of daily life, such as parks, green spaces, campuses, lakes and streams in many countries. When taking IAS prevention and control measures in those living areas, at least one or even several attributes discussed in this paper would be involved. Of course, the estimates and trade-off relations should vary with cultural, social, economic, environmental differences in various countries and the characteristics of areas under prevention and control, but there are no obvious differences in the types of attributes. While carrying out IAS prevention and control, these areas could use the attributes in this paper to estimate the parameters or borrow the estimates of this paper to evaluate the IAS prevention and control measures that cause the least negative externalities to the public, so as to gain public support for IAS prevention and control measures. Major contributions of this paper to the research and practice of ecological conservation are summarizing the negative externalities of IAS prevention and control measures; putting forward an empirical approach to evaluate the public's willingness to pay for IAS prevention and control measures and for negative externalities of the measures; exploring the public's trade-offs of various negative externalities of IAS prevention and control measures; and proposing to reduce the impact of negative externalities on the public by adjusting the combination of those externalities, so as to improve public support for IAS policy and sustainability of NPs.

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Article

Determinants of Behavioral Intentions in the Context of Sport Tourism with the Aim of Sustaining Sporting Destinations

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Abstract: This study was undertaken to examine structural relationships between event quality, tourist satisfaction, place attachment, and behavioral intentions with emphasis on the mediating effects of tourist satisfaction and place attachment on relations between event quality and behavioral intentions in the context of a small-scale recurring sporting event. Responses obtained from 350 attendees were collected and analyzed. Results showed positive impacts of (a) event quality, tourist satisfaction and place attachment on behavioral intentions, (b) event quality and tourist satisfaction on place attachment, and (c) event quality on tourist satisfaction, and demonstrated (d) tourist satisfaction and place attachment partially mediate relationships between event quality and behavioral intentions and that (e) place attachment partially mediates the relationship between tourist satisfaction and behavioral intentions.

Keywords: event quality; tourist satisfaction; place attachment; behavioral intentions; sport tourism; sporting event

1. Introduction

Intense competition between countries and regions in the tourism industry has resulted in focus on behavioral intentions, such as intention to recommend and revisit, being viewed as a prime concern of tourism destinations and their marketing organizations [1,2]. In particular, since the number of people using the Internet has dramatically increased, intention to recommend has become increasingly important as tourists can easily disseminate frank opinions, experiences, and knowledge of visited destinations worldwide through social media using, for example, personal blogs, Facebook, YouTube, and Instagram [3]. Thus, it is critical that destination managers consider behavioral intentions a priority for future success.

Destination marketing organizations should attempt to develop effective and attractive tourism marketing strategies to arouse potential tourists' interests and persuade tourists to visit to a destination [4]. The majority of scholars suggest hosting sporting events provides tourists, especially sports fans, an array of enjoyable and memorable experiences [5]. Sporting events are referred to as hedonic services that offer many tangible and intangible benefits to host countries and regions [6]. Notably, it has been reported small-scale sporting events can attract many domestic tourists and improve destination image almost as effectively as mega sporting events [5]. For this reason, small local communities not able to host large-scale sporting events should consider small-scale recurring sporting events a cost-effective means of attracting tourists.

Given that behavioral intentions are important for sustainable destination management in the context of tourism, destination managers should understand how tourists' behavioral intentions are

formed. Increasing numbers of researchers have concluded tourist satisfaction is probably a key factor of behavioral intentions [7], and it is widely acknowledged that customer satisfaction is crucial for assessing the success of marketing strategies. For this reason, research during the past two decades has focused on this concept and explored its antecedents and consequences [8]. Additionally, the link between place attachment and behavioral intentions is viewed as being of considerable importance in tourism marketing literature [9]. The notion of place attachment has received increasing attention from destination marketers over recent years because the concept represents emotional bonds between tourists and places they have visited and is regarded as a definitive tourism marketing strength [10] that might induce behavioral intentions like loyalty.

Although a number of studies have provided a necessary foundation for sport tourism studies, they have three major limitations. First, few published studies have identified positive relationships between event quality and destination-related variables (e.g., place attachment) or outcome variables (e.g., behavioral intentions). In other words, despite the importance of event quality in the context of attracting sport tourists [11], scant empirical work has been conducted to address whether quality has direct consequences. Thus, the present study sought to expand current theorizations by examining the mutual relationships between event quality, tourist satisfaction, place attachment, and behavioral intentions in response to recent requests from sport tourism researchers to provide more exhaustive analyses.

Second, although prior studies have been conducted to expand understanding of tourist satisfaction, they largely ignored the mediating effects of place attachment on relations between tourist satisfaction and behavioral intentions. Rather, most researchers focused on the direct link between tourist satisfaction and behavioral intentions and overlooked the possibility that place attachment mediates relations between tourist satisfaction and behavioral intentions [2]. Based on existing research on direct effects between these three variables, tourists would seem to be likely to consider ‘place attachment’ an important component of the path between tourist satisfaction and behavioral intentions. In the present study, to promote theory development, we investigated the mediating effect of tourist satisfaction on the relation between event quality and behavioral intentions, and that of place attachment on the relation between event quality and behavioral intentions. Naturally, the four conditions proposed by Baron and Kenny’s [12] were satisfied to establish the validities of mediating effects.

Third, in a sport and tourism context, the majority of studies have focused on large-scale sporting events such as the Olympic Games, the FIFA (Fédération Internationale de Football Association) World Cup, the European Football Championships, and the Asian Games. However, small-scale recurring sporting events have not been well studied. Wong and Tang [5] found small-scale sporting events receive relatively little attention in sport or event tourism literature and argued that such events could lead to loyalty. Hence, it would appear studies on small-scale recurring sporting events add a new perspective to sport tourism literature.

Accordingly, the current study sought to explore mutual relationships between event quality, tourist satisfaction, place attachment, and behavioral intentions collectively and systematically and to place emphasis on their mediating effects at a small-scale recurring sporting event.

2. Theoretical Background, Research Hypotheses, and Model

2.1. Information about Gyeongju City

Gyeongju is a city near the southeastern coast of mainland South Korea and in 2017 had a population of 257,903 [13]. The city was the capital of the 1000-year-long Silla dynasty, an ancient kingdom, which later governed the Korean peninsula [14]. Thanks to the rich cultural and historical heritage of this dynasty, Gyeongju is known as ‘The museum without walls’ and has more tombs, temples, rock carvings, pagodas, cultural artifacts, and Buddhist statues than any other location in South Korea [15]. In 2000, UNESCO (The United Nations Educational, Scientific and Cultural Organization) designated The Gyeongju Historic Area, which contains the ruins of temples and palaces,

outdoor pagodas and statuary, reliefs, Buddhist art, and the Yangdong Folk Village (a traditional clan village dating back to the Joseon dynasty (added in 2010)), a World Cultural Heritage Site [16].

Gyeongju is one of the most popular tourist destinations for international and domestic visitors, especially among those interested in the cultural heritage of the Silla dynasty and the architecture of the Joseon Dynasty [17]. In addition, Gyeongju has placed emphasis on sporting events, especially marathon events, which allow the city to promote its rich tangible cultural heritage via through TV broadcasts [18]. The Gyeongju International Marathon is held annually and attracts around 20,000 spectators and participants [19], and local authorities are hopeful that those visiting the event will recommend it to others and revisit, and thus, promote Gyeongju as a sporting destination [18].

2.2. Event Quality

Undoubtedly, event quality is a crucial topic in sport tourism research and service quality is one of its most important components [11]. Service quality has received much attention in recent years and is recognized as a critical factor because of the influence it has on the psychological and behavioral responses of tourists [20]. Service quality is defined as “a customer’s overall impression of the relative inferiority/superiority of an organization and its services” [21]. Based on existing literature, the current study defines event quality as spectator/participant overall judgement regarding the value of an event attribute. In the context of sport tourism, some studies have defined four dimensions of event quality, that is, game quality, interaction quality, outcome quality, and physical environment quality [11]. According to Jin et al. [11], game quality represents spectators’ impressions about the quality of the game, interaction quality ‘the performance of managing staff and volunteers responsible for delivering services,’ outcome quality “the link between consumers’ perceptions of gains received from interactions with the service provider,” and physical environment quality is the spectators’ evaluations of the qualities of physical facilities. Therefore, in the current study, event quality consisted of 12 items representing game quality, interaction quality, outcome quality, and physical environment quality.

2.3. Tourist Satisfaction

Tourist satisfaction has been widely shown to be one of the most substantial factors of future success, and much has been published on the topic. The theory of tourist satisfaction is rooted in the marketing literature and according to Oliver [22], “satisfaction is defined as pleasurable fulfillment, that is, the consumer senses that consumption fulfilled some need, desire, goal, or so forth, and that this fulfillment is pleasurable.” Some marketing researchers proposed the ‘expectancy disconfirmation model’, which compares initial expectations and perceived performance after consumption and determines the final state of satisfaction [23]. In other words, if a customer perceives he/she has received more value than expected, he/she is satisfied. Some have suggested the cognitive-affective model, which is regarded as being more insightful because consumer perceived satisfaction is more likely to arise spontaneously by cognitive and affective processing [24]. According to Yoon and Uysal [25], tourist satisfaction can be measured using multiple items, and based on previous studies, Lee [26] proposed three travel satisfaction items—overall satisfaction, satisfaction versus expectation, and satisfaction—based on considerations of invested time and effort. The present study used this scale to measure tourist satisfaction.

A vast amount of the marketing literature is dedicated to the direct relationship between service quality and customer satisfaction [27], and in the context of tourism, some studies have shown that service quality and satisfaction are related [28]. Existing research suggests that if tourists highly value a product or service provided at a sporting event, they are more likely to have a high level of satisfaction. Thrane [29] examined possible links between service quality (festival quality), overall satisfaction, and intention to recommend and concluded service quality is a predictor of satisfaction. Yoon, Lee, and Lee [30] also empirically tested relationships between festival quality, visitor satisfaction, and loyalty using a structural approach and demonstrated that improving festival quality can become a

fundamental strategic metric for building tourist satisfaction. Their findings suggested event quality is related to tourist satisfaction. Accordingly, the current study proposed the following hypothesis.

H1: *Event quality influences tourist satisfaction.*

2.4. Place Attachment

Place attachment has received much attention in tourism, environmental psychology, and environmental education literature [31]. The word attachment represents affect and the word place represents the environmental setting to which people have strong attachments [9]. According to Morgan [32], place attachment may be defined as “an affective bond to a particular geographical area and to the meaning attributed to that bond.” In other words, place attachment is commonly conceptualized as an overall connectedness or bond between a person and a location. In many studies, place attachment has been dichotomized into place identity and place dependence. Place identity refers to “the symbolic importance of a place as a repository for emotions and relationships that give meaning and purpose to life” [33], and place dependence reflects “how well a setting serves goal achievement given an existing range of alternatives” [34].

In the context of hospitality management, empirical evidence shows that event quality is influenced by place attachment. Alexandris, Kouthouris, and Meligdis [35] tested the effect of service quality (physical environment quality, interaction quality, and outcome quality) on place attachment on 264 recreational skiers and showed that physical environment quality and interaction quality play central roles in engendering place attachment. Baek, Ryu, and Chae [36] held the view event quality leads to place attachment. They examined the impact of festival quality on visitor place attachment and behavioral intention and concluded that festival quality is critical for stimulating place attachment. Given the direct impact reported in some studies, it was expected that event quality would positively impact place attachment.

H2: *Event quality influences place attachment.*

In line with the development theory of place attachment [32], Hosany et al. [33] acknowledged a link between tourist satisfaction and place attachment. They developed a model based on the development theory of place attachment that provided some useful evidence on the positive effect of tourist satisfaction on place attachment. Su, Cheng, and Huang [37] empirically demonstrated tourist satisfaction is related to place identity and place dependence, and Zenker and Rütter [38] emphasized that satisfaction with a city is a direct antecedent of attachment to the city. Considering previous studies, it seems reasonable to assume that tourist satisfaction positively influences place attachment.

H3: *Tourist satisfaction influences place attachment.*

2.5. Behavioral Intention

Behavioral intention has long constituted an important domain of research in interdisciplinary studies. The concept can be depicted as a tourists’ intention to revisit based on past memorable experiences at a destination and to engage in word-of-mouth [39]. Most researchers have long regarded behavioral intention as one of the most reliable sources of information regarding potential tourists [40]. Lee and Han [41] ascertained behavioral intention can decrease negative recognition and perceived risk of destination, which indicates behavioral intention should be considered when evaluating the success of an event.

The link between event quality and behavioral intention might be explained by a study conducted by Jin et al. [11]. They proposed a conceptual model that included event quality, perceived value, destination image, and behavioral intention, and concluded event quality leads to behavioral intention. Likewise, Moon, Ko, Connaughton, and Lee [42] examined theoretical relationships between service quality at a sporting event, perceived value, destination image, and behavioral intention, and revealed

that service quality significantly influenced behavioral intention. The results of these previous studies hint at a relationship between event quality and behavioral intention, and thus, the current study felt confident enough to postulate a relationship between event quality and behavioral intention.

H4: *Event quality influences behavioral intentions.*

The symbolic relationship between satisfaction and behavioral intentions is a frequent topic in interdisciplinary studies [43], and it is generally believed tourist satisfaction leads to behavioral intention. Chen et al. [2] provided supportive evidence for this link and examined relationships between experience quality, perceived value, satisfaction, and behavioral intention for heritage tourists. Their findings revealed that the more satisfied tourists are with experiences, the more likely they are to revisit and recommend the destination to others. Hutchinson, Lai, and Wang [44] reinforced the link between tourist satisfaction and behavioral intentions. An integrative model that explored relationships between quality, value, equity, satisfaction, and behavioral intentions was developed and tested using golf supporters, and it was concluded tourist satisfaction is a strong predictor of behavioral intentions. Therefore, the current study adopted the following hypothesis regarding the impact of tourist satisfaction on behavioral intentions.

H5: *Tourist satisfaction influences behavioral intentions.*

The relationship between place attachment and behavioral intention has received renewed attention during the past few years. For example, a tourism study by Lee et al. [9] presented evidence showing that place attachment is related to behavioral intention. They examined the relations between place attachment (place identity and place dependence), festival satisfaction, and loyalty (word-of-mouth, revisit intentions, and destination preference), and detected a significant, positive relationship between place identity and revisit intentions, and between place dependence and word-of-mouth. Loureiro [45] explored the relationship between experience economy, place attachment, and behavioral intentions in the context of rural tourism and maintained place attachment acts as an antecedent of behavioral intentions. Accordingly, it seems reasonable to suggest place attachment affects behavioral intention.

H6: *Place attachment influences behavioral intentions.*

With respect to the mediating effect of tourist satisfaction between event quality and behavioral intentions, Lee, Graefe, and Burns [7] demonstrated that satisfaction plays a mediating role between service quality and behavioral intentions. In terms of the mediating effect of place attachment between event quality and behavioral intentions, Alexandris, Kouthouris, and Meligdis [38] indicated that service quality is a key driver of place attachment, which in turn affects consumers' loyalty like behavioral intentions. Also, Jin et al.'s [11] study showed that event quality has a direct effect on behavioral intentions. Regarding the mediating effect of place attachment between tourist satisfaction and behavioral intentions, according to Lee, et al. [9] study, satisfaction indirectly affects word-of-mouth (WOM) via place dependence, and revisit intention via place identity/social bonding of place attachment. Also, existing studies reported satisfaction is a direct antecedent of behavioral intentions [44]. These results strongly support the intervening role of place attachment. Accordingly, the current study proposes the following three hypotheses:

H7: *Tourist satisfaction mediates the relationship between event quality and behavioral intentions.*

H8: *Place attachment mediates the relationship between event quality and behavioral intentions.*

H9: *Place attachment mediates the relationship between tourist satisfaction and behavioral intentions.*

Based on previous studies, the current study proposes the following conceptual model (Figure 1).

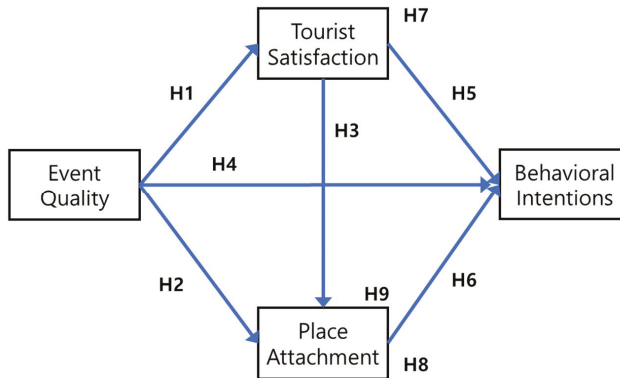


Figure 1. The conceptual model.

2.6. What is Sport Tourism and How It Divides?

Sport tourism has resurged in the past few years as it makes an important contribution to local economy such as improving destination image and attracting a flow of visitors [46]. In fact, many local governments in South Korea view sport tourism as one of the most critical driving forces of tourism success, and strive to host sport events. According to Gibson’s [47] study, sport tourism can be described as leisure-based travel that takes individuals temporarily away from their mundane life to participate in or watch a sporting event or to venerate a sporting heritage. Therefore, the author suggests that sport tourism can be described as three main behaviors: participating, watching, and visiting/venerating. Based on this view, there is explicit consensus among sport tourism researchers that sport tourism is divided into three categories: event sport tourism, active sport tourism, and nostalgia sport tourism [47]. Event sport tourism depicts tourists passively engage in a sporting event as spectators whose main purpose of travel is to cheer for their country and favorite star players or to spend time with family members, friends, and social groups [48]. As such, many countries and regions increasingly consider mega sporting events such as Olympic Games and World Championships as a core component of the destination marketing strategy [6]. Active sport tourism describes tourists actively engage in a sporting event as participants in order to improve mental and physical health, relieve the stress, and meet personal goals [49] (Figure 2). Nostalgia sport tourism represents tourists visit famous sporting venues such as stadiums and museums of the mega sporting events and professional teams [47].



Figure 2. Active sport tourism.

3. Method

3.1. Data Collection

Data for the current study was collected from spectators and participants that attended the 2018 International Marathon in Gyeongju City. To collect a representative sample, the authors and two trained research assistants administered a face-to-face, questionnaire-based survey on 21 October 2018. Using a convenient sampling procedure, 400 people were approached to take part in the survey. No-one was solicited to participate. Finally, 375 questionnaires were completed, but 25 were subsequently eliminated due to nonanswered questions. The remaining 350 satisfactorily completed questionnaires were analyzed. The sample was almost equally split between males (64%) and females (36%). The majority were aged between 40 and 49 years (40.3%, $n = 141$), university educated (44.3%, $n = 155$), married (68.6%, $n = 240$), and earned \$40,000–59,999 (21.7%, $n = 76$) per annum.

3.2. Measures

The survey instrument was developed based on the study objectives and a literature review. A seven-point Likert scale, anchored on unimportant and extremely important (scored as 1 and 7, respectively) was used. The survey questionnaire addressed five domains: (a) event quality, (b) tourist satisfaction, (c) place attachment, (d) behavioral intention, and (e) demographic information. Event quality was assessed using 12 items (3 items addressed game quality, 3 interaction quality, 3 outcome quality, and 3 physical environment quality); these items were adapted from those used by Jin et al. [11] and by Jae Ko, Zhang, Cattani, and Pastore [50]. Tourist satisfaction was assessed using 3 items derived from Yoon et al. [25]. Place attachment was assessed using 6 items (3 items addressed place identity and 3 place dependence), and these items were adapted from Hosany et al. [33] and Williams and Vaske [51]. Behavioral intention was assessed using 6 items (3 items addressed intention to recommend and 3 intention to revisit), and these items were adapted from Hosany et al. [33], Žabkar, Brenčič and Dmitrović [52], and Lam and Hsu [53]. To ensure face validity, three experts with theoretical knowledge were invited to examine the survey items.

3.3. Validity and Reliability

The nine-factor (game quality, interaction quality, outcome quality, physical environment quality, tourist satisfaction, place identity, place dependence, and intention to recommend and intention to revisit) confirmatory factor analysis (CFA) model used had a total of 288 degrees of freedom. The measurement model indicated reasonable fit with data ($\chi^2/df=2.531$, NFI = 0.923, RFI = 0.907, TLI = 0.941, SRMR = 0.046 and RMSEA = 0.066). All model fit indices were within recommended thresholds [54] (Table 1).

Construct validity was assessed using convergent and discriminant validities. To evaluate convergent validity, we calculated factor loadings, construct reliability (CR), and average variance extracted (AVE). All factor loading values were < 0.5 and significant ($p < 0.001$) (Table 1). CR values all exceeded the recommended value of 0.7 (range from 0.827 to 0.914) and AVE values all exceeded the minimum requirement of 0.5 (range 0.615 to 0.780). Therefore, convergent validity was satisfactory (Table 1).

If all the items in the structural equation model are used as observed variables, the complexity of the model increase, which may cause problems such as the size of the sample, the model fit indices, and the significance of the parameter estimation [55]. When there are too many items, the number of items should be adjusted through item parceling [56]. Item parceling is a method of parceling using average when analysis is difficult in the structural equation model due to the large number of observable variables and has become increasingly popular in various area such as education, psychology, and marketing in recent years [56]. To utilize item parceling, convergent validities regarding the three observable variables of game quality, interaction quality, outcome quality, physical environment

quality, place identity, place dependence, intention to recommend, and intention to revisit should be satisfactory.

Table 1. Confirmatory factor analysis (CFA) results for measurement model.

Scale Items	β	CR	AVE	Cronbach
Game quality				
It is exciting to watch skillful players	0.736			
Skill performance of players is excellent	0.763	0.827	0.615	0.783
Information about this event is easy to obtain	0.750			
Interaction quality				
The demeanor of the staff is pleasant	0.841			
I enjoy being with the other spectators	0.888	0.862	0.676	0.860
Spectators follow the regulations	0.733			
Outcome quality				
I view the outcome of this event favorably	0.864			
I really enjoy the social interaction at this event	0.831	0.863	0.677	0.895
I spend quality time with my friend/family at this event	0.884			
Physical environment quality				
The facility is clean and well maintained	0.852			
I am impressed with the design of the facility	0.891	0.880	0.709	0.904
The facility is safe	0.876			
Tourist satisfaction				
Gyeongju is better than I expected	0.866			
It is worth visiting Gyeongju	0.914	0.870	0.691	0.918
Overall, I am satisfied with holidaying in Gyeongju	0.893			
Place identity				
Gyeongju is a very special destination to me	0.894			
I feel very attached to Gyeongju	0.909	0.870	0.691	0.910
Holidaying in Gyeongju means a lot to me	0.845			
Place dependence				
GJ is the best for what I like to do on holidays	0.816			
I would not substitute GJ with any other places	0.884	0.849	0.654	0.784
I got more satisfaction out of holidaying in GJ than others	0.736			
Intention to recommend				
I will recommend Gyeongju to other people	0.930			
I will say positive things about Gyeongju to other people	0.960	0.903	0.756	0.955
I will encourage friends and relatives to visit Gyeongju	0.920			
Intention to revisit				
If had to decide again I would choose GJ again	0.970			
I want to visit Gyeongju	0.922	0.914	0.780	0.956
I intend to visit Gyeongju in next 12 months	0.918			
$\chi^2/df = 2.531$, NFI = 0.923, RFI = 0.907, TLI = 0.941, SRMR = 0.046 and RMSEA = 0.066				

To evaluate convergent validities, we confirmed factor loadings, CR and AVE whose values all exceeded the recommended values (Table 1). Since the convergent validities concerning all observable variables was satisfactory, these variables were parceled as event quality, place attachment, and behavioral intentions, respectively. In other word, each subfactor of event quality, place attachment, and behavioral intentions turned into four, two, and two observable variables, respectively.

To evaluate discriminant validity, we compared the square root of AVE for each construct with correlations between pairs of latent variables [57]. Since it was difficult to verify all latent variables, the pair with the highest correlation was selected and verified. The highest correlation found was 0.729 (between tourist satisfaction and behavioral intentions) (See Table 2) and its square value $(0.729)^2$ was 0.531. AVE for tourist satisfaction was 0.692 and AVE for behavioral intentions was similar at 0.670. Since AVE values were all greater than the square value (0.531), discriminant validity was satisfactory.

Reliability estimates (Cronbach's alpha) for game quality, interaction quality, outcome quality, physical environment quality, tourist satisfaction, place identity, place dependence, intention to recommend, and intention to revisit were above the recommended threshold of 0.7 (range from 0.783 to 0.956), indicating measures were reliable (Table 1).

Table 2. Correlations between constructs.

Constructs	1	2	3	4
Event quality	1			
Tourist satisfaction	0.686 **	1		
Place attachment	0.415 **	0.596 **	1	
Behavioral intentions	0.606 **	0.729 **	0.621 **	1

** $p < 0.01$.

4. Results

Overall, the structural equation modeling (SEM) achieved acceptable fit ($\chi^2 = 0.103.093$, $df = 38$, $\chi^2/df = 2.713$, $p < 0.001$). The absolute fit index (Goodness of Fit Index = 0.951, Standardized Root Mean Residual = 0.031, Adjusted Goodness of Fix Index = 0.915 and Root Mean Error of Approximation = 0.07), and incremental fit index (Normed Fit Index = 0.968 and Relative Fit Index = 0.954) were satisfactory.

Table 3. Structural parameter estimates.

Hypothesis	Path	Coefficient	t-value	Results
1	Event quality → tourist satisfaction	0.736	13.775 ***	Accepted
2	Event quality → place attachment	0.112	2.063 *	Accepted
3	Tourist satisfaction → place attachment	0.647	11.224 ***	Accepted
4	Event quality → behavioral intentions	0.143	2.690 **	Accepted
5	Tourist satisfaction → behavioral intentions	0.436	5.461 ***	Accepted
6	Place attachment → behavioral intentions	0.420	5.150 ***	Accepted

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The estimates of structural coefficients (paths) provided the basis for testing the proposed hypotheses. As shown in Table 3, event quality had a significantly positive effect on tourist satisfaction (0.736 , $p < 0.001$) and place attachment (0.112 , $p < 0.05$), which offers supportive evidence for hypotheses 1 and 2. The path coefficient from tourist satisfaction to place attachment was positive and statistically significant (0.647 , $p < 0.001$), supporting hypothesis 3. Hypothesis 4 was also supported, as event quality significantly and positively influenced behavioral intentions (0.143 , $p < 0.01$). Tourist satisfaction and place attachment were found to influence behavioral intentions directly (0.436 and 0.420 , respectively, $p < 0.001$), which supported hypotheses 5 and 6.

As shown in Table 4, the mediating effect of tourist satisfaction on the relation between event quality and behavioral intentions was found to be statistically significant. In other words, tourist satisfaction showed a partial mediating effect, which supported hypothesis 7. Furthermore, the mediating effect of place attachment on the relation between event quality and behavioral intentions was found to be statistically significant. In other words, place attachment showed a partial mediating

effect, which supported hypothesis 8. The mediating effect of place attachment on the relation between tourist satisfaction and behavioral intentions was found to be statistically significant, that is, place attachment showed a partial mediating effect, which supported hypothesis 9.

Table 4. Mediating effects of tourist satisfaction and place attachment.

Path		Coefficient	S.E.	95% CI (Bias-corrected)	<i>p</i>
Event quality → Tourist satisfaction → Behavioral intentions	Indirect effect	0.406	0.042	0.328 ~ 0.468	0.004
	Direct effect	0.200	0.069	0.093 ~ 0.308	0.006
	Total effect	0.606	0.052	0.517 ~ 0.693	0.003
Event quality → Place attachment → Behavioral intentions	Indirect effect	0.185	0.113	0.056 ~ 0.392	0.008
	Direct effect	0.421	0.125	0.213 ~ 0.598	0.001
	Total effect	0.606	0.052	0.517 ~ 0.693	0.003
Tourist satisfaction → Place attachment → Behavioral intentions	Indirect effect	0.172	0.129	0.047 ~ 0.413	0.011
	Direct effect	0.557	0.139	0.304 ~ 0.712	0.001
	Total effect	0.729	0.032	0.673 ~ 0.776	0.003

As shown in Table 4, the mediating effect of tourist satisfaction on the relation between event quality and behavioral intentions was found to be statistically significant. In other words, tourist satisfaction showed a partial mediating effect, which supported hypothesis 7. Furthermore, the mediating effect of place attachment on the relation between event quality and behavioral intentions was found to be statistically significant. In other words, place attachment showed a partial mediating effect, which supported hypothesis 8. The mediating effect of place attachment on the relation between tourist satisfaction and behavioral intentions was found to be statistically significant, that is, place attachment showed a partial mediating effect, which supported hypothesis 9.

5. Discussion and Conclusions

The main objective of this study was to investigate integrated model positive relationships between event quality, tourist satisfaction, place attachment, and behavioral intentions with emphasis on the mediating effects of tourist satisfaction and place attachment at a small-scale recurring sporting event. The proposed model allows the identification of relationships between (1) event quality and tourist satisfaction, (2) event quality and place attachment, (3) tourist satisfaction and place attachment, (4) event quality and behavioral intentions, (5) tourist satisfaction and behavioral intentions, and (6) place attachment and behavioral intentions, and showed (7) tourist satisfaction and place attachment had partial mediating effects on the relation between event quality and behavioral intentions, and that (8) place attachment partial mediated the relation between tourist satisfaction and behavioral intentions.

From a theoretical point of view, this study provides several contributions to research in marketing, tourism, hospitality, and sport management. First, this study is a response to recent calls to researchers to consider event quality as an antecedent that influences outcome variables such as tourist satisfaction, place attachment, and behavioral [11,42]. In other words, our findings demonstrate the merit of including event quality in studies aimed at better understanding and predicting tourist behaviors, whereas previous studies have almost exclusively considered destination image and tourist satisfaction as determinants of behavioral intentions [40,58]. Furthermore, no previous study has explored structural relationships between event quality, tourist satisfaction, place attachment, and behavioral intentions. Furthermore, our study delineates four dimensions (game quality, interaction quality, outcome quality, and physical environment quality) and suggests 12 items that can be used to accurately reflect the characteristics of sporting event quality [11].

Second, this study sheds new light on the link between tourist satisfaction and place attachment. In fact, the relationship between tourist satisfaction and place attachment is the subject of debate. Some researchers insist satisfaction be conceptualized as antecedent of place attachment [59], whereas

others argue that satisfaction be conceptualized as an outcome of place attachment [60]. Based on a comprehensive analysis by Morgan [32] on place attachment, Hosany et al. [33] held the view that tourist satisfaction is an antecedent of place attachment. Likewise, Lee et al. [9] found “to a greater extent, satisfied visitors become attached to a community due to attributes and features that support their experience-related needs.” Thus, the consensus appears to be that tourist satisfaction is an antecedent of place attachment.

Third, this study heeds the call of Loureiro [45] by seeking to understand the role of place attachment in a tourist behavioral model. More specifically, Loureiro emphasized place attachment is central to the understanding of behavioral intentions and urged further investigation be conducted on the relationship. In this respect, the present study creates a link between place attachment and behavioral intentions by showing that an affective bond with the destination, based on past meaningful and memorable experiences, may lead to an intention to engage in word-of-mouth communications and revisit. Also, we tested the relationship between place attachment and behavioral intentions, and found place attachment is an important predictor of behavioral intentions among sport tourists, which is in accord with previous studies [9,61].

Fourth, this study contributes to tourism studies by examining the mediating effects of tourist satisfaction and place attachment on the relation between event quality and behavioral intentions. Our results highlight the need to include event quality, tourist satisfaction, and place attachment in models aimed at determining sport tourists’ intentions to recommend and revisit a destination. Notably, our findings demonstrate tourist satisfaction partially mediates place attachment. The relations found in the present study make an important contribution to the sport tourism literature because they reveal that while event quality plays a pivotal role in nurturing behavioral intentions, tourist satisfaction and place attachment also play key roles by strengthening behavioral intentions. Furthermore, they indicate intention to recommend and revisit can be developed through tourist satisfaction and place attachment as well as by event quality.

Fifth, the study also revealed place attachment mediated the relationship between tourist satisfaction and behavioral intentions. In particular, although the proposed model was grounded in extant literature, the present study is the first to incorporate place attachment as a mediator of the relation between satisfaction and behavioral intentions. Furthermore, the results obtained show place attachment has a partial mediating effect and confirm that tourist satisfaction indirectly influences behavioral intentions via place attachment. Previous studies have overlooked the mediating role of place attachment on the path from tourist satisfaction to behavioral intentions. By exploring the mediating effect of place attachment, the present study helps to address a gap in current tourism marketing literature and represents an important step toward understanding tourist psychology and behavior.

From a practical point view, the results of the present study provide meaningful guidelines to destination marketers in the context of sporting tourism destinations. First of all, they demonstrate that strengthening the quality of an event should be considered a priority by destination marketers. Our findings demonstrate that event quality has a positive effect on tourist satisfaction, place attachment, and behavioral intentions, and should encourage destination marketers to make strenuous efforts to improve the four latent dimensions of event quality (i.e., game quality, interaction quality, outcome quality, and physical environment quality) to meet the needs and desires of sporting tourists.

To improve game quality, event organizers should endeavor to attract talented and competent players to participate. It is intuitively assumed that if competent players are involved, tourists’ interests in the event will be increased. To enhance interaction quality, volunteers and staff should be trained and educated well, because acts of kindness can have considerable positive impacts on tourists [33], whereas displays of a negative demeanor or inhospitality result in negative attitudes toward the destination and event. To develop physical environment quality, destination managers should increase safety-orientated security and maintain the cleanliness of facilities. Constant efforts are required to develop positive perceptions of environment quality and to ensure the success of

sporting events. In addition, the current study suggests hosting events offer excellent educational opportunities for vocational college and university students, especially those majoring in marketing, tourism, hospitality, or sport management. Students could participate as volunteers to help and communicate with visitors. Such efforts would contribute to the development of event quality and help create positive behavioral intentions.

Several limitations of this study warrant consideration. First, the cohort was composed individuals visiting the venue for the first-time and repeat visitors, which may differ in terms of travel characteristics, travel motivations, and post-trip evaluations [33]. The current study suggests this aspect be explored in the future research by multigroup analysis. Second, the proposed model includes only a handful of constructs, and thus, to more fully understand sport tourist psychology and behaviors, we suggest additional antecedents (e.g., emotional experience, destination image, and motivation) of tourist satisfaction and behavioral intentions be included in future studies. Third, relations between tourist satisfaction and place attachment were investigated to determine the path between event quality and behavioral intentions, and there is a possibility that other variables such as perceived value and brand image also have mediating effects. These variables should also be addressed to provide a more comprehensive framework.

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Article

Adopters versus Non-Adopters of the Green Key Ecolabel in the Dutch Accommodation Sector

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Abstract: Accommodation providers such as hotels, campsites, and holiday villages can use ecolabels to show their green credentials to potential customers. Whereas there is extensive literature on ecolabel adoption in the Hotel and Bed and Breakfast (B & B) sector, no such research exists for other accommodation sectors. In this paper, we present the results of statistical analyses of survey data from firms in the Dutch accommodation sector (including hotels, campsites, and group accommodations) with and without the Green Key ecolabel, which is a third-party certified international label for the tourist and leisure sector. We obtain insights into the motivations for adopting (or not), analyze the characteristics of firms with and without the label, and get an indication of the perceived impact of ecolabel adoption on costs and profits. We find that previously found results for hotels and B & Bs do not always apply to other subsectors of the accommodation sector. We also find that obtaining the label required a limited investment for almost half of the sample, and resulted in cost reductions for more than half of the responding firms.

Keywords: ecolabel; sustainable tourism; certification; hotel management; campsites; ecolabel adoption

1. Introduction

Accommodation providers, such as hotels and campsites, impact the environment in various ways, including water and energy use, impact on the landscape, and disposal of waste and wastewater [1–3]. While companies in the accommodation sector increasingly voluntarily implement sustainable business practices, such ‘green’ production processes may be more costly than conventional ones [4–8]. Furthermore, since green goods are credence goods [9], consumers are not able to recognize environmental attributes when purchasing the product. Ecolabels can help reduce this information asymmetry. When a firm applies for a third-party certified ecolabel, a verifying body assesses the firm. If it passes the test, the firm receives a label that allows it to communicate to customers that it is green according to the standards set by the labeling organization [10,11]. Hence, ecolabels reduce consumers’ costs for searching for information about product characteristics [12]. Although green products may be more costly to produce, green customers may be willing to pay a price premium over the price of ‘brown’ conventionally produced goods (e.g., [13,14]). If adopting firms turn from the provision of brown goods to green goods or if consumers switch from brown to green goods after observing an ecolabel, ecolabels may help reduce environmental impacts. Ecolabels are, as a (voluntary) policy instrument, especially relevant for sectors that are subject to little environmental regulation from public authorities, such as the tourism sector [15]. Buckley ([4], pp. 187–192) provides a great description of the rise and development of ecolabels in tourism.

The aims of this paper are (1) to assess the motivations for firms in the Dutch accommodation sector (not) to adopt an ecolabel; (2) to assess how labeled firms perceive the effect of adoption of the Green

Key label on profits and costs, and what investments were required; and (3) to analyze the differences between firms with and without the ecolabel in terms of firm characteristics, market conditions, and perceptions of ecolabels. We present results from survey data on the motivation of firms in the Dutch accommodation sector to adopt or not to adopt the Green Key ecolabel and analyze the characteristics of firms that did (not) adopt the label. The Green Key ecolabel is a third-party certified international label that is used in the tourist and leisure sector to show that companies make more effort than required by law to be environmentally sustainable. We contribute to the existing literature on ecolabel adoption in the accommodation sector in three ways. First, while the existing literature focuses on hotels and Bed and Breakfasts (B & Bs, e.g., [5,12,16]), our study is the first to analyze ecolabel adoption by campsites and holiday villages as well. Second, most of the literature on ecolabels in the accommodation sector uses qualitative methods and small samples (e.g., [5,8,16]), or only studies labeled [17] or unlabeled firms [18]. We present statistical evidence based on survey data from more than 200 firms and analyze how firms with and without the label differ in the Dutch accommodation sector at large as well as in each of the subsectors. We not only present results from statistical tests for the distribution of the variables, but also analyze whether results from these tests still hold in multiple regression analyses. Third, we present initial quantitative evidence on the perceived impacts of ecolabel adoption on costs and profits.

The case study of our analysis is the Green Key ecolabel, which is an international label that is used in the tourist and leisure sector to show that companies make more effort than required by law to be environmentally sustainable [19]. The Green Key label is issued by a non-profit non-governmental organization, and can be adopted voluntarily. Green Key International started as a Danish initiative in 1994 and was adopted by the Foundation for Environmental Education (FEE) in 2002, making it an internationally recognized label [20,21]. The Dutch branch of Green Key has its origin in the 'Milieubarometer' (Environmental Barometer). This label started in 1998 as an initiative from businesses in the recreational and tourist industry. In 2003, a European cooperative started between different labels, resulting in the merger of these labels. In 2007, the name 'Milieubarometer' changed to 'Green Key'. With this change, the international Green Key guidelines replaced the original guidelines, but because the Milieubarometer had stricter guidelines than Green Key, the Dutch Green Key guidelines were adapted to these. Hence, the Dutch branch of Green Key has different, stricter, standards than the international ones. Guests should be unaware of the environmental measures taken, in the sense that comfort levels should not be negatively affected.

The entrance fee is €195, which covers the costs of verification. The annual fee depends on annual turnover; the maximum rate is €725 for companies with a turnover of at least €1.2 million. Verification is done by a third party: Groen Belicht. The criteria and standards comprise 13 categories, such as water, waste, and energy [22]. The requirements for each category differ per subsector, e.g., hotels and campsites have different requirements within the same category. There are obligatory norms for obtaining the label, which is indicated as the 'Bronze' label, that include water-saving norms for showers and toilets, bans on single-service packages, and serving coffee and tea from sustainable brands. In addition, there are 'Silver' and 'Gold' labels. If a firm meets at least 52% of the optional norms, it can obtain the 'Gold' label. Optional norms range from the use of ecolabeled cleaning products to installation of Combined Heat and Power units for electricity and heat generation. In this paper, we do not differentiate between the different categories.

We focused on firms in the accommodation sector as defined by SBI-code I-55 of the Dutch Chamber of Commerce. We focus our study on the subsectors hotels, conference centres, campsites, holiday villages, group accommodations, natural campsites, mini campsites, and B & Bs, and excluded about 50 companies from subsectors as diverse as 'restaurants', 'public swimming and indoor halls', 'passenger transport by boat', and 'outdoor sports' that are clearly distinct from the accommodation sector. Holiday villages consist of a few dozen up to a few hundred houses with one or more bedrooms, and typically cater to families and offer swimming and dining facilities. For our analysis, 'hotel' and 'B & B' were combined into one group, as were 'campsite', 'natural campsite', and 'mini-campsite'

(into ‘Campsite’), as were ‘holiday villages’ and ‘group accommodations’ (into ‘Holiday villages and group accommodations’). The group ‘Conference centres’ largely consists of conference centres and other activity centers (music and theatre). Some hotels that were classified in the first group offer conference rooms as well.

We find that results for the hotel and B & B sector are not necessarily representative for the accommodation sector as a whole. For example, we find that labeled hotels and B & Bs are larger than their unlabeled counterparts, but we find mixed results for campsites and holiday villages. Whereas statistical tests show that labeled firms tend to agree more than unlabeled firms with the statement that consumers are confident that the information conveyed by ecolabels is reliable, this result disappears in all of our multiple regression models. Regarding profits and costs: while more than half of responding firms with a Green Key label reported a reduction in variable costs after adoption of the label, only 26% reported an increase in profits. Interestingly, almost 40% of responding firms had to make investments of €500 or less to obtain the label.

The remainder of this paper is organized as follows. In the next section, we present a survey of the literature and key items of our survey. In Section 3, we introduce the Green Key ecolabel and describe the sampling and data collection procedures. In Section 4, we first present results on the motivations of firms for adopting the Green Key label and present reported changes in profits and the costs of labeled firms. We then analyze characteristics of firms with and without the label for the Dutch accommodation sector as a whole and for the various subsectors. We also use a probit model to test whether these results still hold in a multiple regression model of ecolabel adoption and assess how the probability of being labeled is affected by firm characteristics. In Section 5, we discuss our results, and we conclude in Section 6.

2. Literature and Key Survey Items

In this section, we review the literature on the adoption of ecolabels in the accommodation sector to identify the key variables needed in our empirical assessment of ecolabel adoption in the Dutch accommodation sector. Since the literature on ecolabels is rather limited, we also include literature on the adoption of environmental management systems (EMSs). We follow Ayuso ([23], p. 209) and define an EMS as having the aim to “manage the environmental performance of the company and improve it continuously according to a planned strategy”, whereas the aim of an ecolabel is to “ensure the environmental performance of the company with regard to certain aspects, and offer the corresponding information to the consumer”. Hence, ecolabels are more consumer-oriented than EMSs.

2.1. Motivations for Adoption

Economic theory suggests that eco-label adoption allows ‘green’ producers to demand a higher price than their ‘brown’ competitors, which is needed because of the higher costs of production when using sustainable production processes [24]. However, Rivera [12] did not find evidence that the hotels that participate in the Costa Rican Certification for Sustainable Tourism program were able to demand higher prices. Indeed, possession of an ecolabel does not seem to lead to increased sales for hotels and B & Bs [12,16]. Motivations for an ecolabel can largely be grouped into two categories: business benefits and green philosophy. Tzschentke et al. [8] interviewed 30 owner-managers of small hotels and B & Bs that were members of the Green Tourism Business Scheme (GTBS), and found that the decision to join the GTBS was based on “the prospect of commercial benefits, the knowledge that joining required little or no change to current practices, and the fact that the principles of the scheme were ones the owner-manager endorsed” (p. 120). Based on interviews with 30 managing directors of Spanish hotels, Ayuso [15] found that hotels that adopt an ecolabel have a history of environmental practices, and do not have to make big investments to get certified. Duglio et al. [17] found that personal awareness of the sustainability issue and improving the corporate image were the main motivation for adoption of the European ecolabel by Italian accommodation establishments. Dunk et al. [5] asked 109 members and former members of the GTBS in Scotland about their reasons and expectations for joining. Allowing

for multiple answers, 63% gave 'green philosophy and practice' as a reason for joining. With 58%, the group indicating 'business benefits' as one of the reasons was not much smaller.

The literature on EMSs confirms the (mixed) results for ecolabels. Implementation of an EMS seems to lead to cost savings rather than cost increases in the hotel sector, often with little investment. Geerts [6] found that 17 out of 21 interviewed managers of London hotels had implemented sustainable business practices to save costs, whereas less than half of the respondents implemented them for environmental motivations. Ayuso [15] found that envisioned cost savings are one of the main motivations for initiating environmental practices (including both ecolabels and EMSs), yet more than half of the respondents also mentioned personal awareness, and EMS adoption is rather motivated by a feeling of getting recognized for the efforts by a third party.

Garay and Font [25] found that economic motivations are only secondary to altruistic reasons such as environmental protection in their analysis of (mostly small) hotels in Catalunya. Ayuso [15] found that an EMS does not seem to lead to increased sales for hotels and B & Bs.

Adoption of an ecolabel usually comes with certification costs. In addition to the monetary costs of certification, assessment by the certification agency is a time-consuming process. These costs can induce managers not to adopt the ecolabel, despite meeting the label's standards [15].

In the survey, we asked respondents about their motivation (not) to adopt an ecolabel. We also asked certified firms about the investments they had to make and the resulting cost savings and change in profits.

2.2. Differences in Characteristics of Firms with and without an Environmental Management Tool

The tourism literature suggests that firms (in this literature: hotels and B & Bs) with an EMS can differ from their uncertified competitors along various dimensions. Obtaining certification is a costly and time-consuming process that may be too costly for small firms [6,23,26]. Larger firms may have higher awareness and more resources to undertake the process of implementation and adoption [6,27,28]. Segarra-Oña et al. [7] found that hotels in Spain with an ISO 14001 certificate are generally larger than hotels without. Since hotels that belong to a chain can use a central management unit for the certification process, having multiple establishments may matter [23,29,30]. Ayuso [15] found that the involvement of hotel management and staff is a critical factor for the implementation of an EMS in Spanish hotels, which suggests that the larger the number of employees, or the larger the number of organisational layers in the firm, the harder it becomes to implement an EMS.

In addition to size, age might be a firm characteristic that is relevant for ecolabel adoption: younger firms may be more willing to adopt new business practices than older firms. Indeed, based on the sustainable entrepreneurship literature, Hockerts and Wüstenhagen ([31], p. 481) argued that "in the early stages of an industry's transformation towards sustainability, it is typically small firms and new entrants that stimulate disruptive sustainability innovation".

Segarra-Oña et al. [7] reported that the share of Spanish hotels with ISO14001 certification is higher for rural hotels than for city hotels.

As noted above, green philosophy can be a motivation to adopt an ecolabel or EMS. Sampaio et al. [16] found that the environmental preferences of the owners or managers matter for the adoption of the GTBS label, while Ayuso [23] found the same for the adoption of environmental practices (including both ecolabels and EMSs).

We asked our respondents about the age of their firm, its size, whether it had multiple establishments, its location (rural or urban), and to what extent sustainability is important for their company.

2.3. Market Conditions

The adoption of an ecolabel allows a firm to differentiate itself from its competitors. The opportunity for a firm to do so will depend on the characteristics of the market in which it operates. Geerts [6] interviewed 21 managers of hotels in London that had joined a certification scheme (although not

necessarily one that is third-party certified) and concluded that price, location, and quality appeared to be more important for guests when booking a hotel than certifications. Hence, we asked respondents to what extent they think that customers value sustainability, and whether firms in the sector compete on price, quality, or green image.

Ecolabel adoption can be viewed as the diffusion of a new technology in a sector, which is a gradual process [32]. Firms would like to have information about the new technology before adopting it, and can acquire this information from early adopters in their sector. As a consequence, adoption might differ between subsectors (hotels, holiday villages, campsites), also because of differences in sector-specific characteristics (including technologies and costs to meet the requirements of the label) and regulation. A firm's probability to be certified will also be affected by the behavior of their competitors [33]. Therefore, we asked firms in which subsector they operate, to what extent they agree with the statement "many competitors have an ecolabel", and for an estimate of the percentage of competitors with an ecolabel.

2.4. Perceptions of Ecolabels

Ecolabels can signal to consumers that the labeled firm uses 'green' production technologies and allow their holders to show to customers that their environmental efforts are real and genuine rather than 'greenwash'. Chen and Chang [34] analyzed the relation between greenwash and consumers' green trust in electronics products in Taiwan, and found that greenwash is positively related to consumer confusion. Consumer attitudes toward ecolabels matter, as an ecolabel should be understood and trusted by consumers [11,35,36]. Hence, adopting firms may be more confident that consumers trust ecolabels than unlabeled competitors. Still, several studies reported that hotel managers argue that customers are unfamiliar with or sceptical toward certification schemes, possibly because there are so many of them [18,37,38]. We asked respondents to what extent they agree with the statement, "Consumers are confident that the information conveyed by ecolabels is reliable". We also asked respondents to what extent they agree with the statement "Consumers understand the meaning of ecolabels".

Following the same reasoning, firms' trust in the label is equally important. Firms will only invest in costly certification if they think that the label successfully separates sustainable from unsustainable firms: the higher the perceived accuracy of the certification procedure, the fewer unsustainable firms will apply and pay for certification [24]. Therefore, we asked firms about their perceptions of the assessment of ecolabeled firms.

3. Research Questions, Case Study, Sampling, and Data Collection

3.1. Research Questions and Hypotheses

The aim of the paper is to analyze differences between firms in the Dutch accommodation sector that did and did not adopt the Green Key ecolabel. To that purpose, we formulated the following research questions: (1) What are the motivations for firms in the Dutch accommodation sector (not) to adopt an ecolabel? (2) How do labeled firms perceive the effect of adoption of the Green Key label on profits and costs, and what investments were required? (3) What are the differences between firms with and without the ecolabel in terms of firm characteristics, market conditions, and perceptions of ecolabels? Regarding the latter, we have the following hypotheses based on the discussion of the literature in Section 2:

- a positive correlation between firm size and ecolabel adoption;
- a negative correlation between age and ecolabel adoption;
- a positive correlation between being located in a rural area and ecolabel adoption;
- a positive correlation between firms' views on sustainability and ecolabel adoption;
- a positive correlation between firms' views on consumers valuation of sustainability and ecolabel adoption;

- a positive correlation between the (perceived) number of labeled competitors and ecolabel adoption;
- a positive correlation between firms' views on consumers perceptions about ecolabels and ecolabel adoption;
- and a positive correlation between firms' own perceptions of ecolabels and ecolabel adoption.

3.2. *Sampling and Data Collection*

A list of all the Dutch Green Key labeled companies can be found on the website of Green Key Netherlands [39]. We first contacted companies with multiple references (e.g., hotels belonging to a chain) to check whether it was centrally decided to adopt the label or if they had decided to adopt it independently. Our final list—of Green Key labeled firms that had either independently adopted the Green Key label or adopted it through the chain's central management—consisted of 270 firms. The unlabeled companies were selected from the website of the Dutch Chamber of Commerce [40]. A database was created, including all the companies within the accommodation sector in the Netherlands (SBI-code I-55), except for the about 50 firms mentioned above. Additionally, the following characteristics were selected: the results had to be business enterprises that were still economically active and were the main office within that enterprise. This resulted in 6622 different potential observations, which were arranged by their Chamber of Commerce registration number. From this list, 650 unique random numbers were drawn, and the corresponding firms were selected. When a firm either had a Green Key label or did not have an email address, the next firm on the list was selected. For each selected unlabeled firm, it was checked whether it was part of a franchise organization or chain.

The final database consisted of 918 companies, of which 270 had a Green Key ecolabel and 648 did not. All the firms were approached via email for an online survey, for which we used the web-based tool Qualtrics. After one week, a first reminder was sent to each firm that had not completed the questionnaire by then, and another week later, a second reminder was sent. In total, 206 unique respondents started the questionnaire and at least indicated whether they had a Green Key label, of which 89 had the Green Key label and 117 had no ecolabel. Unfortunately, not all the questionnaires were fully completed, and hence, the number of observations differs per variable. More information on the questions used in the survey and the number of responses per question can be found in Appendix A.

We tested whether our sample of responding firms is representative for the sample of the firms that we contacted using the sector in which the firm operated and the province where the firm is located (the only variables for which we have information for both samples). We were not able to reject the null hypothesis (5% significance level) that the proportions in the sample of responding firms were equal to the proportions in the sample of firms contacted, for both the labeled and unlabeled firms.

The questionnaire included questions covering the key variables identified in the literature (see Section 2). Descriptive statistics can be found in Table A1 in Appendix A.

4. Results

4.1. *Motivations for Adopting or Not Adopting*

We asked firms for their main motivation for (not) adopting the Green Key ecolabel. Respondents could only mention one reason. As can be seen in Table 1, the two main reasons for labeled firms to adopt the Green Key label were “better for the environment” and “good for the image of the company”. Interestingly, “it increases profits” was mentioned only once, and differentiation from competitors was also mentioned far less often than the first two reasons.

Table 1. Frequency distribution of reasons for Green Key labeled firms for adopting the label.

Reason for Being Labeled	Frequency
Better for the environment	23
Good for the image of the company	23
To differentiate within the sector	9
It increases profits	1
The competition has a label as well	1
Other	13
Missing	19
Total	70

We not only asked labeled firms for their motivations to adopt an ecolabel; we also asked unlabeled firms why they had not adopted an ecolabel. Table 2 shows that almost one-third of responding firms did not deem it necessary to have an ecolabel in order to be sustainable. A large group of firms mentioned costs as a reason not to adopt an ecolabel: 20 firms indicated that the investments to be made in order to comply with the standards would be too large, while eight firms indicated that certification costs are too high. Only two firms thought that their variable costs would increase after adoption of the label. A lack of demand for environmentally sustainable services was mentioned by nine firms.

Table 2. Frequency distribution of reasons for unlabeled firms for not adopting an ecolabel.

Reason for Not Being Labeled	Frequency
It is not necessary to have an ecolabel in order to be sustainable	32
The investments that have to be made in order to comply with the standards are too large	20
There is not enough demand for environmentally sustainable services in my sector	9
The certification costs are too high	8
The variable costs would increase	2
I can ask a lower price than my competitors	1
Other	26
Missing	19
Total	98

4.2. Labeled Firms: Profits and Costs

We found that, of the 68 Green Key labeled firms that responded to the question of whether their profits had increased due to adoption of the ecolabel, 26% stated that their company had become more profitable after adoption, but only 4% reported that they were able to increase their price. This suggests that the profit increase resulted from a decrease in costs. Indeed, while 10% of responding labeled firms reported an increase in variable costs after adoption of the label, 58% reported a decrease in variable costs (N = 71). Of the 43 firms reporting a percentage change in variable costs after adoption of the label, five reported an increase, and 15 reported a decrease. The mean change in variable costs was -3.2% (t-stat. -2.55), where we excluded one observation where a 100% reduction was reported, which we deemed unrealistic. Of the 18 labeled companies reporting an increase in profits, 15 stated that this was due to lower variable costs, whereas three reported that this was due to a higher price.

In our sample, of all the labeled firms that reported on fixed adjustment costs (N = 56), 18% reported zero adjustment cost, and 21% reported positive investment costs of €500 or less. Still, mean investment costs were €17.634, the median was €3.000 and the maximum reported investment was €350.000, suggesting that while a substantial fraction of firms that adopted the Green Key ecolabel had zero or little adjustment costs to fulfill the criteria, this is not a general rule for adopting firms.

4.3. Differences between Labeled and Unlabeled Firms

In this section, we present the results of statistical tests in which we compared firms with the Green Key ecolabel against firms without an ecolabel. Depending on the structure of the underlying data, we reported results for Mann–Whitney, Fisher’s exact, and Pearson’s Chi-squared tests.

4.3.1. Firm Characteristics

We asked firms with and without the Green Key ecolabel about the size of their firm, and did so for various dimensions: number of full-time equivalent (FTE) employees, revenues (in five categories, ranging from less than €100,000 to more than €5,000,000), and whether the firm had multiple establishments. The results in Table 3 show that for all three variables, the null hypothesis (either equal distribution for labeled and unlabeled firms or that the proxy for size is independent of being labeled) is rejected. Inspection of the relative frequency distributions shows that in all cases, the distribution for labeled firms is shifted to the right. Labeled firms tend to have more employees (the mean is 21.3 FTE for firms with the Green Key label and 3.7 for unlabeled firms), and more revenues than unlabeled firms. This suggests that larger firms are more able to bear the monetary and non-monetary costs of ecolabel adoption than smaller firms. Labeled firms also tend to have more establishments than unlabeled firms (means: 1.35 and 1.03 respectively). Labeled firms are also older (means: 36 and 26 years, respectively).

Table 3. Labeled vs. unlabeled firms: firm characteristics. FTE: full-time equivalent.

Variable	Hypothesis	Test Result	N
Employees (FTE)	Same distribution labeled and unlabeled firms	$z = 4.33$ ***	97
Revenues (five categories)	Revenues independent of being labeled	$p = 0.00$ ***	119
Multiple establishments	Having multiple establishments independent of being labeled	$p = 0.02$ **	206
Age	Same distribution labeled and unlabeled firms	$z = 2.48$ **	204
Sustainability important for company (five categories)	Response to statement in-dependent of being labeled	$p = 0.00$ ***	151
Urban	Urban yes/no independent of being labeled	$p = 0.02$ **	191

*/**/** indicates statistically significant at the 10/5/1% level.

We asked respondents to what extent (five-point Likert scale, ranging from ‘Strongly agree’ to ‘Strongly disagree’) they agreed with the statement ‘[company name] has the opinion that sustainability is important’. Labeled firms tended to agree more strongly with this statement than firms without a label. Unfortunately, we could not assess whether this was a reason for adoption, or this was a result of adoption (for example, through increased environmental awareness).

The final firm characteristic concerns the location of the firm for firms with only one establishment (N = 191). Firms with the Green Key ecolabel tend to be more often located in urban areas than unlabeled firms.

Table 4 shows the results by subsector. Hotels and B & Bs with the Green Key label tend to be larger than unlabeled competitors along all the dimensions. In all the subsectors, labeled companies tend to have more revenues than unlabeled firms. Labeled holiday villages and group accommodations also tend to have more employees. The number of establishments appears to be larger for labeled firms only in the Hotel and B & B sector.

Table 4. Labeled vs. unlabeled firms: firm characteristics by subsector.

Variable	Hotels and B & Bs	Campsites	Holiday Villages and Group Accommodations	Conference Centers
Employees (FTE)	$z = 3.39$ *** (36)	$z = 1.29$ (32)	$z = 1.85$ * (15)	$z = 1.61$ (13)
Revenues (five categories)	$p = 0.01$ *** (43)	$p = 0.08$ * (42)	$p = 0.03$ ** (19)	$p = 0.02$ ** (15)
Number of establishments	$p = 0.01$ *** (76)	$p = 0.39$ (62)	$p = 0.56$ (36)	$p = 0.69$ (31)
Age	$z = 0.84$ (75)	$z = 2.17$ ** (62)	$z = 1.98$ ** (36)	$z = 2.03$ ** (30)
Sustainability important for company (five categories)	$p = 0.00$ *** (57)	$p = 0.04$ ** (46)	$p = 0.07$ * (25)	$p = 0.40$ (22)
Urban	$p = 0.02$ ** (68)	- ^a (61)	- ^a (35)	$p = 0.13$ (26)

*/**/***/ indicates statistically significant at the 10/5/1% level. Number of observations in parentheses. ^a All the campsites and holiday villages and group accommodations reported to be located in a rural environment.

Interestingly, the age distribution of firms does not differ for labeled and unlabeled hotels and B & Bs, while labeled firms tend to be older in all the other subsectors.

Whereas labeled and unlabeled conference centers do not seem to differ in their response to the statement '[company name] is of the opinion that sustainability is important', labeled firms in the other subsectors tend to agree more strongly with this statement than unlabeled firms. It should be noted that the number of observations is smallest for the former group.

Labeled hotels and B & Bs were more likely to be located in urban areas than their unlabeled competitors. Zero campsites, holiday villages, and group accommodations (both labeled and unlabeled) were located in urban areas.

4.3.2. Market Conditions

Market conditions may affect the willingness of a firm to adopt an ecolabel. We asked firms to what extent they agree with the statement 'Customers value sustainability', using a five-point Likert scale. As shown in Table 5, firms with the Green Key ecolabel tended to agree more strongly with the statement than unlabeled firms.

Table 5. Labeled vs. unlabeled firms: Market conditions.

Variable	Hypothesis	Test Result	N
Customers value sustainability (five categories)	Response to statement independent of being labeled	$p = 0.02$ **	149
Competition focuses on price	Same distribution labeled and unlabeled firms	$p = 0.28$	150
Competition focuses on green image	Same distribution labeled and unlabeled firms	$p = 0.52$	150
Many competitors have an ecolabel (five categories)	Response to statement independent of being labeled	$p = 0.00$ ***	148
Percentage of competitors that have an ecolabel	Same distribution of labeled and unlabeled firms	$z = 6.43$ ***	122

*/**/***/ indicates statistically significant at the 10/5/1% level.

Next, we asked respondents about the main item of competition in the sector: price, quality, green image, or 'other'. There was not a statistically significant difference between the two groups of firms for any of the items. Interestingly, even though it does not seem that labeled firms operate in an environment in which competition focuses on having a green image, labeled firms tended to agree

more strongly with the statement ‘Many of my competitors have an ecolabel’ than unlabeled firms, and they tend to report a higher number for the percentage of competitors that has an ecolabel.

Table 6 presents the results on market conditions by subsector. At the subsector level, the result that labeled firms tended to agree more strongly with the statement that customers value sustainability was only confirmed for hotels and B & Bs. This was probably partly driven by the small sample sizes for the other subsectors. The absence of a statistically significant difference in the perception of the focus point of competition also shows up at the level of the subsectors.

Table 6. Labeled vs. unlabeled firms: market conditions by subsector.

Variable	Hotels and B & Bs	Campsites	Holiday Villages and Group Accommodations	Conference Centres
Customers value sustainability (five categories)	$p = 0.10^*$ (57)	$p = 0.79$ (47)	$p = 1.00$ (25)	$p = 0.58$ (19)
Competition focuses on price	$p = 0.45$ (56)	$p = 0.29$ (47)	$p = 0.30$ (24)	$p = 0.37$ (22)
Competition focuses on green image	$p = 0.71$ (56)	$p = 0.36$ (47)	$p = 0.54$ (24)	$p = 0.82$ (22)
Many competitors have an ecolabel (five categories)	$p = 0.00^{***}$ (53)	$p = 0.08^*$ (47)	$p = 0.42$ (25)	$p = 0.02^{**}$ (22)
Percentage of competitors that have an ecolabel	$z = 3.59^{***}$ (45)	$z = 1.22$ (36)	$z = 3.05^{***}$ (21)	$z = 2.71^{***}$ (20)

*/**/** indicates statistically significant at the 10/5/1% level. Number of observations in parentheses.

In all the subsectors except for holiday villages and group accommodations, labeled firms tended to agree more strongly with the statement that many competitors have an ecolabel than unlabeled firms. However, when it comes to the reported number of competitors with an ecolabel, campsites were the only sector in which labeled firms did not report a statistically significant higher number for the percentage of competitors that had an ecolabel than unlabeled firms.

4.3.3. Perceptions of Ecolabels

The results in Table 7 show that the two groups of firms did not differ in their response to the statement ‘Consumers understand the meaning of ecolabels’. Interestingly, not a single firm responded ‘strongly agree’, and for both groups of firms, a large share responded with ‘disagree’ or ‘strongly disagree’. Firms with the Green Key ecolabel tended to agree more strongly with the statement ‘Consumers are confident that the information conveyed by ecolabels is reliable’ than unlabeled firms. It should be noted that the opinion of labeled firms may have been formed after adoption of the Green Key label.

Table 7. Labeled vs. unlabeled firms: perceptions of ecolabels.

Variable	Hypothesis	Test Result	N
Consumers understand the meaning of ecolabels (five categories)	Response to statement independent of being labeled	$p = 0.29$	145
Consumers are confident that the information conveyed by ecolabels is reliable (five categories)	Response to statement independent of being labeled	$p = 0.07^*$	146
There is sufficient assessment of compliance of labeled firms with ecolabel’s rules (five categories)	Response to statement independent of being labeled	$p = 0.00^{***}$	147

*/**/** indicates statistically significant at the 10/5/1% level.

Green firms may be more willing to adopt an ecolabel when they trust its assessment procedure, while brown firms may be less likely to adopt a label when there is sufficient assessment of compliance. Green Key-labeled firms tended to agree more strongly with the statement ‘There is sufficient assessment of compliance of labeled firms with ecolabel’s rules’ than unlabeled firms. However, whether this was already the case before adoption, or labeled firms became confident due to their experience with the Green Key assessment procedure is not clear.

When we analyzed the responses at the level of subsectors (Table 8), some interesting results appeared. Hotels and B & Bs seemed to be the only sector in which labeled firms tended to agree more strongly with the statement that consumers are confident that the information conveyed by ecolabels is reliable. While for the ‘Holiday villages and group accommodations’ and ‘Conference center’ groups, this may have been caused by the relatively small subsamples, the result for Campsites was rather striking, as not only was the sample rather large, the p-value of the Fisher Exact test was also very high. Whereas two unlabeled firms strongly agreed with the statement, zero labeled firms did.

Table 8. Labeled vs. unlabeled firms: perceptions of ecolabels by subsector.^a

Variable	Hotels and B & Bs	Campsites	Holiday Villages and Group Accommodations	Conference Centers
Consumers are confident that the information conveyed by ecolabels is reliable (five categories)	$p = 0.05^*$ (54)	$p = 0.80$ (45)	$p = 0.33$ (25)	$p = 0.59$ (21)
Consumers understand the meaning of ecolabels (five categories)	$p = 0.36$ (52)	$p = 0.54$ (47)	$p = 0.75$ (25)	$p = 0.21$ (21)
There is sufficient assessment of compliance of labeled firms with ecolabel’s rules (five categories)	$p = 0.00^{***}$ (54)	$p = 0.00^{***}$ (46)	$p = 0.00^{***}$ (25)	$p = 0.79$ (22)

^a*** indicates statistically significant at the 10/5/1% level. Number of observations in parentheses.

Table 7 shows that there was no statistically significant difference between the responses of the two groups to the statement ‘Consumers understand the meaning of ecolabels’. This result was also found for each of the subsectors.

The result that labeled firms tend to agree more strongly with the statement ‘There is sufficient assessment of compliance of labeled firms with ecolabel’s rules’ than unlabeled firms seems to hold for all of the subsectors except for the conference centres. The non-significance for conference centres can be explained by the sample size: only four unlabeled conference centres responded to this statement.

4.4. Econometric Analysis

The previous section presented the results of one-way statistical tests. In this section, we present results of a multiple regression analysis. We use probit and logit models to analyze which variables affect the likelihood of having adopted the Green Key ecolabel. The dependent variable takes a value of one if the firm adopted the Green Key ecolabel and the value of zero if it had not (we excluded the dummy variable for location in an urban as opposed to rural area, since this question was only asked to firms with a single establishment). The independent variables included are those that showed statistically significant differences between labeled and unlabeled firms in the one-way statistical analyses above. For firm characteristics, these are age, size (one of the reported proxies), sector, and whether the respondent (strongly) agreed with the statement that sustainability was important for the company, were we used the natural logarithm of $(1 + \text{age})$ to decrease the skewness of the data and avoid having to take the logarithm of zero. We have not reported the results for size in terms of number of FTE, since the number of observations was too low for the regression results to be meaningful. For market conditions, we included one of two proxies for the number of competitors that had an

ecolabel: a dummy equal to one when the respondent strongly disagreed with the statement that many competitors had an ecolabel, or the reported percentage of competitors that had an ecolabel. Here we used “(strongly) disagree” because “(strongly) agree” has zero respondents without the Green Key label. We use the natural logarithm of $(1 + \text{reported percentage})$ for the percentage of competitors with an ecolabel to decrease the skewness of the data and avoid having to take the logarithm of zero. In addition we included a dummy variable that was equal to one when the respondent (strongly) agreed with the statement that customers valued sustainability. For the perceptions of ecolabels (of firms and of customers), we included a dummy variable that was equal to one when the respondent (strongly) agreed with the statement that there was sufficient assessment of compliance of labeled firms, and a dummy that was equal to one when the respondent (strongly) agreed with the belief that customers were confident that the information conveyed by ecolabels was reliable.

To facilitate interpretation of the regression results, Table 9 reports marginal effects (average marginal effects over all the observations), which were calculated based on the results from the probit and logit estimations, instead of coefficients from the regressions. Column (1) presents results for a probit model. The probability of having adopted the Green Key label was 0.367 higher for firms with multiple establishments (a proxy for firm size) than for firms with a single establishment, controlling for all of the covariates. The marginal effect for age shows that a 10% increase in age increases the probability of having adopted the Green Key label by 7%. Firms in the sectors Hotels and B & Bs, Campsites, and Holiday villages and group accommodations had a probability of being labeled that was about 0.3 lower than the Conference centers sector. We could not reject the null hypothesis that the probability was identical for the former three sectors ($p = 0.75$). Regarding variables that describe market conditions: firms that (strongly) disagreed with the statement that many competitors had an ecolabel were 20% less likely to adopt the Green Key label than firms that were neutral toward the statement or (strongly) agreed, and firms that (strongly) agreed with the statement that sustainability was important for their company were 39% more likely to have adopted the label than their peers. Perceptions of customers' attitudes toward ecolabels did not seem to be correlated with the probability of having adopted the Green Key label, whereas having (strongly) agreed with the statement that labeled firms were sufficiently assessed was positively correlated with ecolabel adoption (probability of having adopted was 0.4 higher).

In columns (2)–(4), we report the results of sensitivity analyses. In column (2), we present results for a logit regression model instead of a probit model. The results were nearly identical. The results in column (3) are based on a probit model with four revenue categories as proxies for size rather than a dummy for having multiple establishments (note that this regression has fewer observations). The reference group has revenues of less than €100,000. Larger firms were 19–26% more likely to have adopted the Green Key label. While the probability of adoption for the largest firms cannot be statistically distinguished from that of the smallest firms, it also did not differ statistically from the firms with revenues ranging from 0.5 to 1.5 million euros. All the other results were close to those in column (1), except for one: the probability of adoption for Campsites did not differ statistically from that of the Conference centres sector. For the results in column (4), we replaced the dummy for strongly disagreeing with the statement that many competitors had an ecolabel by the logarithm of the reported percentage of competitors that had an ecolabel. A 10% increase in the perceived percentage of labeled competitors increased the probability of adoption by 6.6%, which confirmed that perceptions of competitors having a label were positively correlated with the probability of having adopted the Green Key label. All the other results were close to those in column (1), except for a positive correlation between (strongly) agreeing with the statement that consumers valued sustainability and Green Key adoption, which was statistically significant. Finally, in column (5), we present results for a regression without potentially endogenous independent variables. Again, size and age were positively correlated with adoption, and the Conference centres sector had a higher probability of adoption than the other sectors. In addition, the firms that (strongly) disagreed with the statement that many competitors had an eco-label were less likely to have adopted the Green Key label, as in the other regressions.

Table 9. Marginal effects from probit and logit regressions.

Dependent: Has Green Key label (Yes = 1)	(1)	(2)	(3)	(4)	(5)
	Probit	Logit	Probit	Probit	Probit
Multiple	0.367 *** (0.05)	0.366 *** (0.05)		0.314 *** (0.06)	0.412 *** (0.13)
Age	0.072 ** (0.03)	0.071 ** (0.03)	0.061 * (0.03)	0.081 *** (0.03)	0.097 *** (0.04)
Hotel and B & B	-0.282 *** (0.09)	-0.290 ** (0.12)	-0.236 ** (0.11)	-0.268 ** (0.12)	-0.451 *** (0.11)
Campsite	-0.320 *** (0.09)	-0.330 *** (0.12)	-0.169 (0.12)	-0.367 *** (0.11)	-0.363 *** (0.11)
Holiday vill. and group acc.	-0.338 *** (0.10)	-0.336 *** (0.13)	-0.213 * (0.12)	-0.328 *** (0.12)	-0.322 *** (0.12)
Disagr. Many labelled Competitors	-0.197 *** (0.06)	-0.188 *** (0.06)	-0.230 *** (0.06)		-0.268 *** (0.08)
Sustainability important	0.388 *** (0.05)	0.392 *** (0.05)	0.358 *** (0.06)	0.401 *** (0.05)	
Cons. value sustainability	0.057 (0.05)	0.053 (0.05)	0.058 (0.06)	0.112 ** (0.05)	
Consumers confident	0.008 (0.05)	0.013 (0.06)	0.042 (0.07)	0.013 (0.06)	
Firms assessed	0.402 *** (0.06)	0.399 *** (0.06)	0.368 *** (0.06)	0.319 *** (0.06)	
Revenue 100–500K			0.187 ** (0.08)		
Revenue 500–1500K			0.255 *** (0.09)		
Revenue >1500K			0.185 (0.12)		
% competitors with label				0.066 *** (0.02)	
Log-likelih.	-40.449	-40.825	-30.517	-29.087	-75.008
Chi ²	75.538	59.181	81.286	71.241	39.33
Pseudo-R ²	0.574	0.570	0.599	0.633	0.251
N	138	138	111	115	146

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Huber–White robust standard errors in parentheses. Model statistics from underlying probit/logit model.

5. Discussion

To our knowledge, the results from the literature on ecolabels mostly focus on motivations and perceptions rather than firm characteristics, market conditions, and perceptions of ecolabels. Consequently, most references in this section refer to the EMS literature.

We find that labeled hotels and B & Bs are larger than their unlabeled counterparts, which is in line with findings by Segarra-Oña et al. [7] for the ISO14001 adoption by Spanish hotels. However, our results are mixed for the other subsectors, where labeled firms tended to be larger in terms of revenues, but not in terms of the number of establishments, and only labeled holiday villages and group accommodations were larger than their unlabeled competitors in terms of employees. Although the sustainable entrepreneurship literature [31] suggests that smaller and younger firms stimulate disruptive sustainability innovation, we found that firms with the Green Key label were not smaller, and tended to be older. This might be due to the low innovative character of the sustainable measures that are necessary to obtain the label, such as water and energy reduction and offering sustainable food and beverages. Labeled firms tend to have more establishments than unlabeled firms, which is in line with the findings of Álvarez Gil et al. [29] and Ayuso [23] for EMSs. Ayuso [23] found that staff involvement is critical for the implementation of an EMS in hotels, which suggests that smaller

hotels are more likely to adopt sustainable business practices. Our result that labeled hotels are larger than their unlabeled competitors suggests that either larger firms are able to involve their staff, or staff involvement is less important than previously thought (perhaps because being well-organized is more important than the involvement of individual staff members).

We find that labeled hotels and B & Bs are more likely to be located in urban areas than their unlabeled competitors. This is contrary to the findings of Segarra-Oña et al. [7] for ISO14001 adoption by hotels.

The two groups of firms did not differ in their response to the statement ‘Consumers understand the meaning of ecolabels’. Interestingly, not a single firm responded ‘strongly agree’, and for both groups of firms, a large share responded ‘disagree’ or ‘strongly disagree’. This is in line with earlier findings that consumers are unfamiliar with or sceptical toward certification schemes [6,15]. Hotels and B & Bs seemed to be the only sector in which labeled firms tended to agree more strongly with the statement that consumers are confident that the information conveyed by ecolabels is reliable. Again, this result shows that whereas most of the research on ecolabel adoption in the tourism sector focuses on the Hotel and B & B sector, the results for this sector are not necessarily representative for other subsectors of the accommodation sector.

Multiple regression analysis confirmed the results of the statistical tests for most of the variables. However, the correlation between adoption and firms’ perceptions of consumers’ opinions on sustainability and reliability of ecolabels largely disappeared in the regression analysis.

6. Conclusions

The economics literature on ecolabel adoption hypothesizes that using green production technologies leads to higher production costs and requires a higher price. The tourism literature—often using small samples of firms that are not randomly selected—finds that ecolabel adoption tends to lead to lower costs. Using a large, randomly selected sample of firms confirms the results from the tourism literature: labeled firms on average faced a reduction in costs, but did not increase their price.

The tourism literature on ecolabel adoption focuses on the Hotel and B & B sector. We extended this by including campsites and group accommodations. Our results for hotels and B & Bs only partially confirmed the findings from the literature. In addition, we found that the results for this subsector of the accommodation sector are not representative for other subsectors: campsites, holiday villages and group accommodations, and conference centers. We found that hotels and B & Bs with the Green Key label tended to be larger than unlabeled competitors. Labeled companies in all the subsectors of the accommodation sector tended to have more revenues and, apart from Campsites, more employees (in FTE). Labeled hotels and B & Bs also tended to have more establishments than unlabeled competitors. These results suggest that economies of scale (for example, resulting in the availability of monetary and non-monetary resources, or being able to apply the same assessment procedure to multiple establishments) matter for ecolabel adoption. While the age distribution of firms in the Hotel and B & B sector did not seem to differ for labeled and unlabeled firms, labeled firms in the other subsectors tended to be older than unlabeled firms. Labeled firms reported a higher number for the percentage of competitors with an ecolabel than unlabeled firms did. However, it does not seem that labeled firms operate in a business environment in which competition focuses on having a ‘green image’.

Adoption of the Green Key label and implementing sustainable business practices led to a reduction in costs for 58% of respondents with an average cost reduction of 3.2%. Furthermore, almost 40% of respondents indicated that they had to make investments of €500 or less to meet the Green Key requirements. Green Key offers potential adopters the opportunity of opening a test account for a free self-assessment so that firms can get an impression of the efforts to be made to obtain the label. To expand the adoption of its label, Green Key could communicate the opportunity for a free self-assessment and that fulfilling the criteria can lead to permanent cost savings, possibly at relatively low investment costs, more clearly to potential adopters.

A limitation of this study is that we cannot assess causality. For example, Green Key-labeled firms tended to agree more strongly with the statement ‘There is sufficient assessment of compliance of labeled firms with ecolabel’s rules’ than unlabeled firms. However, whether this was already the case before adoption, or labeled firms became confident due to their experience with the Green Key assessment procedure, cannot be assessed with our data. Another limitation is that not all the surveys were fully completed. Response rates were lower for questions toward the end of the survey, which probably had less to do with fatigue (the median completion time was 7 min) and more with the questions at the end being the more sensitive ones (e.g., on profits and turnover). Indeed, in an earlier pilot of the survey, these questions were at the start of the survey, and companies were very reluctant to participate in the survey at all.

In this paper, we focused on ecolabel adoption. Obviously, adoption of the label does not necessarily imply that labeled firms improved their environmental outcomes to comply with the label’s standards. As noted, firms may decide to adopt the label because they were already compliant with its standards. Therefore, the question of the label’s effects on environmental outcomes is an interesting path for future research. Another interesting question is whether the presence of labeled competitors induces firms to implement sustainable business practices without adopting the label, thereby possibly reducing costs without having to spend money on certification and annual fees. Third, while we found evidence for a profit increase and a cost decrease after adoption, and most respondents were not able to increase their price, we did not assess changes in turnover and occupancy rates. Finally, the potential role of ecolabels in the sharing economy would be interesting to assess. Can ecolabels be expanded to private apartments such that they can be advertised on sharing websites such as AirBnB, and what would be the costs and benefits for the suppliers, customers, and local communities?

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Appendix A Survey Response and Descriptive Statistics

Section 3.2 provides a brief description of our sample. Here, we provide some more details.

As noted in Section 3.2, 206 unique respondents started the questionnaire and at least indicated whether they had the Green Key label. Table A1 shows the response rate (column N) per variable. Note that many variables are categorical variables (e.g., province and Likert-scale questions with the scale ranging from 1, ‘strongly agree’, to 5, ‘strongly disagree’).

The first block in Table A1 shows the response rate to the questions that we used to check our sample: the province in which the firm is located (see Section 3.2), the sector in which it operates (see Section 3.2), whether it is familiar with the Green Key ecolabel, whether the firm has an ecolabel, and if so, which ecolabel. All the firms that had an ecolabel had the Green Key ecolabel and were familiar with it.

The second block of variables contained the reasons (not) to adopt an ecolabel. See Section 4.1 of the main text.

The third block presents response rates and descriptive statistics for the variables used in Section 4.2. Note that these questions only apply to firms that possess the Green Key ecolabel, i.e., the sample could not be larger than 89. Since these questions refer to the firm’s finances, respondents were reluctant to respond to these questions. Only 57 firms were willing to indicate the size of their investment to obtain the label, and only 71 firms were willing to indicate whether their variable costs increased, decreased, or had stayed the same after adoption. Of these, 25 firms were willing to assign a (non-zero) value to

the percentage change in variable costs. Of the 89 labeled firms, 69 were willing to indicate whether they had become more profitable after adoption and whether they had been able to ask a higher price.

The final block of variables in Table A1 presents the descriptive statistics of the variables used in the statistical and econometric analyses of Sections 4.3 and 4.4.

The median time used to complete the survey was 7 min. Since some respondents took a break during the survey, the average time was 31 min. The response rate was lower for questions toward the end of the survey. Overall, 13% of contacted firms completed the survey, and 22% indicated at least whether they had an ecolabel and some additional information. While the 22% response rate was lower than average for unannounced online surveys of managers [41], lower response rates for questions toward the end of the survey were not [42] Response rates were lower for questions toward the end of the survey, which probably had less to do with fatigue (given the median completion time of 7 min) and more with the questions at the end being the more sensitive ones (e.g., on profits and turnover). Indeed, in an earlier pilot of the survey, these questions were at the start of the survey, and companies were very reluctant to participate in the survey at all.

Table A1. Descriptive statistics.

	N	Mean	Std. Dev.	Min.	Max.
Province	193	6.91	3.39	1	12
Sector	205	4.33	2.84	1	9
Know Green Key (Y/N)	206	0.65	0.48	0	1
Has ecolabel (Y/N)	206	0.43	0.49	0	1
Which ecolabel (GK/other)	89	1.00	0.00	0	1
Reason label	70	2.61	1.81	1	6
Reason no label	98	4.79	2.16	1	7
Investment (€)	57	17,324	52,006	0	350,000
Variable costs up/down/same	71	2.17	0.58	1	3
Variable costs up (%)	5	10.00	3.53	5.00	15.00
Variable costs down (%)	20	14.40	21.27	0.00	100.00
More profitable (Y/N)	69	1.74	0.44	1	2
Higher price (Y/N)	69	1.96	0.20	1	2
Employees (FTE, log)	97	1.51	1.28	0.00	5.44
Revenue (5 categories)	119	2.08	1.19	1	5
Multiple (Y/N)	206	0.07	0.26	0	1
Age (years, log)	206	3.01	1.02	0.00	5.17
Sustainability important for company (5 categories)	151	1.86	0.76	1	4
Urban (Y/N)	191	0.16	0.36	0	1
Consumers value sustainability (5 categories)	150	2.85	0.78	1	5
Competition_point (4 cat)	151	2.01	1.06	1	4
Many competitors have ecolabel (5 categories)	149	3.44	0.98	1	5
Percentage competitors with label (%)	122	23.62	27.51	0.00	100.00
Consumers understand (5 categories)	146	3.41	0.78	2	5
Consumers confident (5 categories)	147	2.31	0.68	1	5
Assessment of compliance (5 categories)	148	2.55	0.75	1	5

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Article

Electricity Forecasting Improvement in a Destination Using Tourism Indicators

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Abstract: The forecast of electricity consumption plays a fundamental role in the environmental impact of a tourist destination. Poor forecasting, under certain circumstances, can lead to huge economic losses and air pollution, as prediction errors usually have a large impact on the utilisation of fossil fuel-generation plants. Due to the seasonality of tourism, consumption in areas where the industry represents a big part of the economic activity follows a different pattern than in areas with a more regular economic distribution. The high economic impact and seasonality of the tourist activity suggests the use of variables specific to it to improve the electricity demand forecast. This article presents a Holt–Winters model with a tourism indicator to improve the effectiveness on the electricity demand forecast in the Balearic Islands (Spain). Results indicate that the presented model improves the accuracy of the prediction by 0.3%. We recommend the use of this type of model and indicator in tourist destinations where tourism accounts for a substantial amount of the Gross Domestic Product (GDP), we can control a significant amount of the flow of tourists and the electrical balance is controlled mainly by fossil fuel power plants.

Keywords: electricity; tourism; time series; forecasting

1. Introduction

Tourism is growing worldwide, as is its environmental impact on tourist destinations. Evaluating the impact of tourism goes further than evaluating the economic facet; it must also take into account both its environmental and social dimensions [1,2]. Among the environmental dimensions, positive and negative impacts on biodiversity, erosion and physical damage, pollution, resources or landscape change have been reported [3]. The extent and nature of the environmental impact of tourism is related to the magnitude of the development and the volume of visitors, but also to the spatial and temporal concentration of tourism activities [4]. Thus, accurate forecasting of visitors allows to allocate the appropriate resources benefiting the sustainable development of tourism destinations [5]. Specifically, in the Balearic Islands, one of the main resources to manage is electricity. The vast majority of services require it to function, and have great economic and environmental impact.

Electricity demand management is a key factor—its development and use are increasing, both in terms of production and distribution. The efficiency of managing such resources has a big economic impact, as electricity powers a large amount of devices of any kind used. Energy cannot be stored in large quantities; rather, it must be produced on demand. Losses are generated when there is a mismatch between production and consumption. As energy is produced based on consumption prediction, reducing losses necessitates improving demand forecasts. A better prediction model will improve electricity production management.

The main objective of this paper is to present a new short-term prediction model for energy consumption that incorporates tourism indicators as a predictor. More precisely, we propose a new model that improves consumption prediction in an area where the tourism industry accounts for a big amount of the Gross Domestic Product (GDP), the Balearic Islands. Following Bakhat and Roselló [6], we incorporated Daily Human Pressure Indicator (DHPI). DHPI considers the variation on the population due to the increase or decrease of tourists. We hypothesised that the variation of the population in the tourism area is impacting the amount of electric energy consumed while other factors, such as temperature, remain constant. Therefore, introducing DHPI in a prediction model will improve significantly the energy consumption prediction.

The paper is structured as follows: in Section 2, we review the literature concerning the worked topics, in Section 3, we study the electrical demand in the Balearic Islands, and the associated emissions; in Section 4, we introduce the new model including a touristic indicator; in Section 5 we analyse the results and discuss them. Section 6 reflects on the conclusions and limitations of the study.

2. Literature Review

Research into the environmental impact of the tourism industry [7–9] has been focused primarily on determining the impact of transportation utilisation subserving it. Indeed, air transportation alone is believed to account for more than 60% of this impact. Scott et al. [10–12] analysed the tourism impact on Climate Change and Paris Agreement effects for the tourism industry.

Becken and Simmons [13] and Gössling [14,15] have described the potential environmental damage caused by tourism activities. Tourism impact on emissions has been reported by several authors (Meng et al. [16], Lee y Brahmaasrene [17] Paramati et al. [18]). Specifically, tourism contributes approximately 5% to the global emissions of CO₂ [19]. Important here is the increasing concern across countries about global warming, as is impacted by the latter. Such concerns extend to the energetic impact of tourism activities [20,21] as the industry represents one of the greatest energy consumers [7,13,15,22–25], especially in the European Union where travel and tourism represents the highest contributor to the GDP and visitors' exports [26].

Studies have also paid attention to the hospitality industry ([16] Becken et al. [23,27]), a subsegment of tourism, as a primary energy consumer. World Tourism Organization and the United Nations Environment Programme estimated that accommodation accounts for 21% of tourism's total greenhouse gas emissions [26].

Despite these worrisome indicators, the broadscale energy consumption and environmental pollution caused by tourism have not declined since the 1990s [10,11,28–31]. Pablo-Romero et al. [32], in fact, found an increasingly positive relationship between electricity consumption of the hospitality sector and overnight stays, and Katircioglu et al. [29] reported a positive relationship between tourist arrivals and energy consumption. Consequently, they recommended energy-efficiency measures, such as the adoption of renewable energy systems and the development of energy management capabilities. Moreover, the electricity consumption elasticity values of the hospitality sector (with respect to tourist overnight stays) have the highest values in touristic areas, indicating that for the same overnight stays the impact on electricity consumption is higher in these areas and, thus negatively affecting sustainability [33]. Other researchers [31,34,35] have indicated that provision of quality hotel service can produce increases in energy consumption.

The increase of tourism in certain areas is expected to increase the environmental impact on tourist destinations. Several initiatives have recently been undertaken by destination stakeholders to reduce its negative effects. These actions have focused mainly on governments setting environmental policy measures, setting objectives and providing financial support to reduce their carbon footprint [36] and tourism companies reducing energy and water consumption [37,38]. Following this line, there is still room for improvement within the actual technological system. More precisely, improving energy consumption prediction is able to reduce the environmental impact of energy utilisation and, at the same time, lower its overall cost.

Production management is also affected by generation units. Generation units are distributed between the available electrical production technologies that enable the electricity source to control the amount of production. Lags between demand and production turn out to be harmful to the environment, as they typically cause a higher use of fossil fuel-generation plants. When this occurs, carbon dioxide production from electricity production is increased, as is the cost of the energy. Hobbs [39] pointed out that a 1% prediction improvement can save thousands, even millions of dollars. More precisely, Hong [40] estimated that a 1% improvement in the short-term demand forecasting in an electrical system (based on 1GW peak demand) can save approximately \$600,000 per year. Unfortunately, there is a research gap related to the evaluation of the environmental impact of this prediction inefficiency. However, using the Balearic Islands (Spain) consumption and emissions data from Red Eléctrica de España (Transmission system operator in Spain), we estimated that a 2% prediction error might be generating 1 T CO₂/hour additional emissions.

3. Data

3.1. Electricity Demand and Their Emissions

Electricity management is a key factor in the Balearic Islands. Resources are limited, and a full power supply to citizens and industries must be ensured. The responsibility of this electricity distribution, as well as the operational planning of the production units and demand forecasting, is the responsibility of the Transmission System Operator (TSO). For that reason, Red Eléctrica de España (REE), the unique TSO in Spain, is always endeavouring to improve forecasting models to obtain more accurate predictions. REE continuously provides electricity demand in the Balearic Islands through the website www.ree.es. The overall electricity demand, forecasts and emissions can be obtained for each Island separately. They are provided in intervals of 10 min. In this paper, we developed the research model using an hourly resolution; this information was therefore cropped. We used available data from May 2013 to October 2015. Figure 1 shows the hourly electricity demand in Mallorca. Menorca's demand provided similar results, but different from the peninsula.

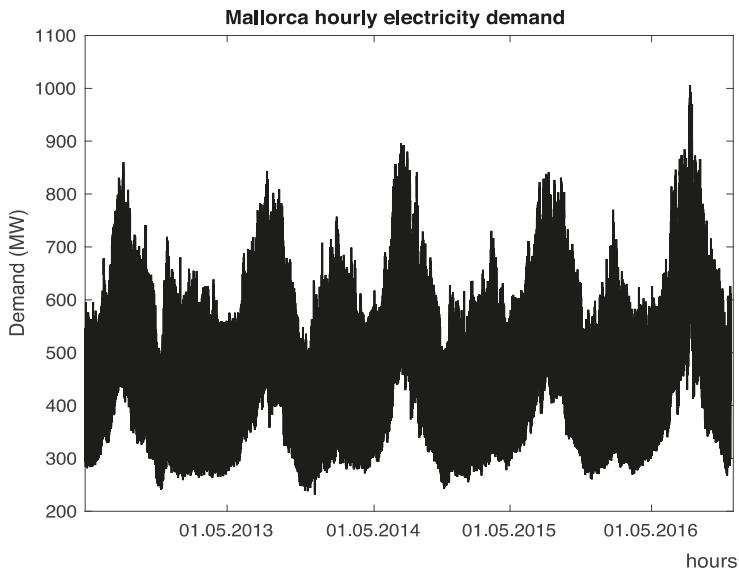


Figure 1. Hourly electricity demand in Mallorca.

The series shows effects that are highly influenced by the seasons, with maximum peaks occurring in summer and at the Easter holiday. This seasonality is mainly caused by tourism activity, as it is the main economic driver of the region. A comparison of the Islands' Gross Domestic Product (GDP) and that of Spain, provided by Instituto Nacional e Estadística (INE) and Exceltur (main tourism non-profit group formed by 28 leading Spanish tourist groups), is shown in Figure 2. This accounts for the direct, indirect and induced effect on the GDP [41]. It can be easily shown how the tourism activity reaches up to 45% of the GDP in the Islands, whereas in Spain it only reaches 11%. In addition, the figure shows an increasing trend of this activity in the GDP from 2010. Thus, the more people coming into the Islands, the more consumption of electricity, as explained in the introduction.

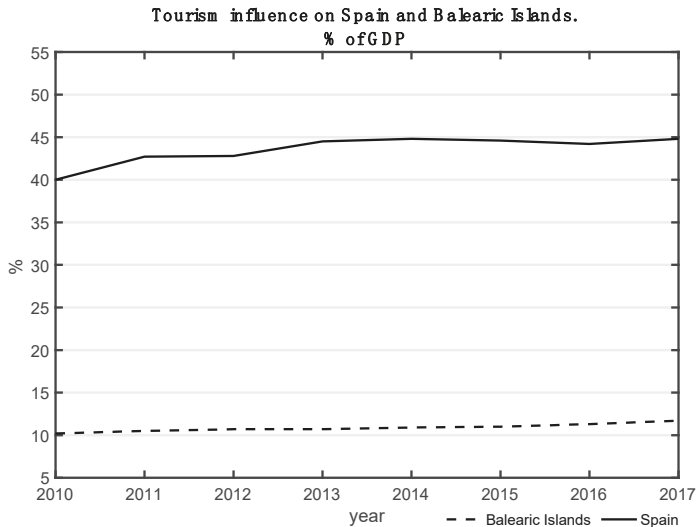


Figure 2. Tourism Gross Domestic Product (GDP) in the Balearic Islands against Spain's. Source: Own elaboration based on Incotur's and Exceltur's information.

Herce [42] analysed the economy in the Balearic Islands, as well as its electricity generation. He highlighted how between 1990 and 2005, CO₂ emissions increased to 62.2%. This increase was due to the power usage of fossil fuel stations (which reached up to 97% of the produced energy in the Islands). The "Plan Director Sectorial Energético de la Illes Balears" [43], a sectorial energetic plan, promoted the construction of an interconnexion cable between the peninsula and the archipelago, as well as integration of renewables within the energy-generation system. However, as shown in Figure 3, the evolution of emissions is not yet under control. Emissions of CO₂ are increasing as overall demand grows. However, more importantly, the emission factor (in T CO₂/MWh) is also increasing (although its slope is less steep). The factor, altogether, reflects a worsening in the emissions objectives.

Figure 4 elucidates some of the primary factors causing emissions to continue their upward climb. Coal power stations represent half of the electrical generation. They are generally used as the main source, although other alternatives with less negative environmental impact are available. Renewables have a low generation ratio and, despite the green-focused policies, the ratio is still about 5%. The way to reduce this trend is to make greater investments in renewable energies [44]. In addition, a more useful and accurate electricity demand forecast would help to program the generation units (thereby enabling a change in the ratio of energy sources in favour of those that are renewable [45,46]).

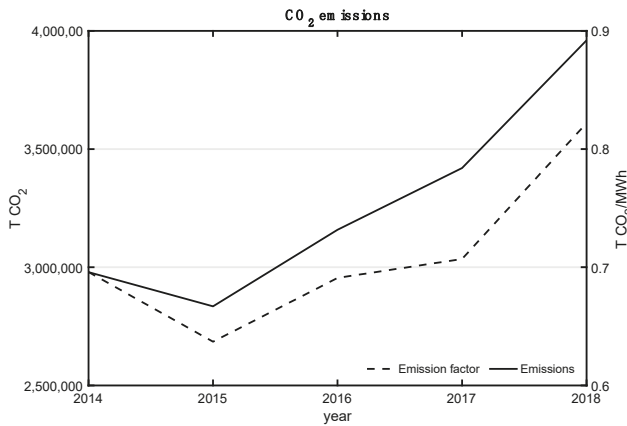


Figure 3. Evolution of the CO₂ emissions in the Balearic Islands due to power generation. The emissions factor is measured as a weight of emissions per MWh, right axis.

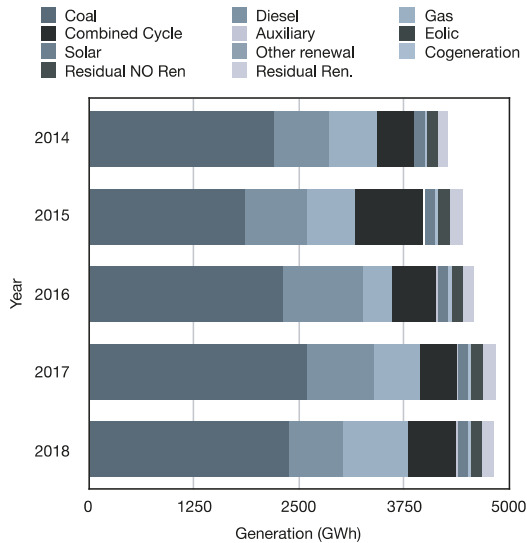


Figure 4. Distribution of the electricity generation in the Balearic Islands.

The evolution of emissions and electricity demand shown in the previous figures reveal that the increasing trend is directly related to economic growth, and in particular to tourism activity. This is not an isolated case. Pfenninger and Keirstead [47] analysed several scenarios combining all kinds of energy sources in the UK. They concluded that there is no clear direction to be taken. There are still many constraints making fossil fuel power plants a source that needs to be exploited.

3.2. Daily Human Pressure Indicator (DHPI)

Figure 5 shows data regarding arrivals and departures to and from the Islands, through both air- and seaports. It can be seen that tourist arrivals by ship and airplane exceed 20,000,000 passengers. The plot shows an increasing trend, due in part to local government policies [48,49]. Tourism can be expected to remain the main economic activity in the Island in the ensuing years.

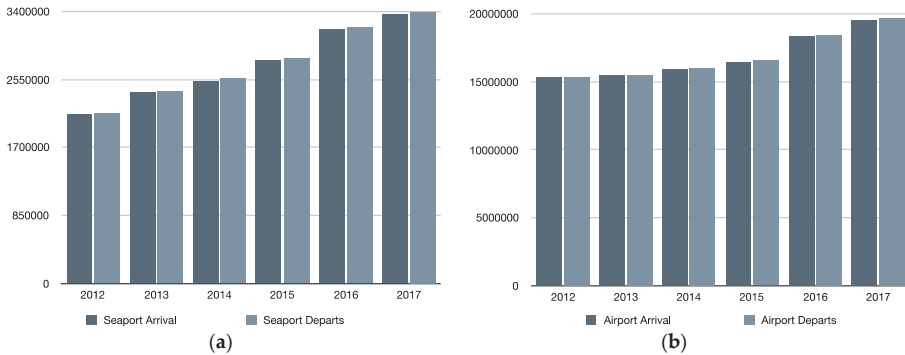


Figure 5. Balance of arrivals and departures to/from Balearic Islands. (a) seaport data; (b) airport data. Source: IBSTAT.

However, these data cannot be directly integrated into a model. Both variables are dependent and cannot be worked separately. Nevertheless, the Institut d’Estadística de les Illes Balears (IBSTAT) publishes annual data regarding visitors to the Islands, obtained from data provided by the Balearic government (through an indicator named Daily Human Pressure Indicator; DHPI). This indicator measures the quantity of people in the Islands each day, incorporating tourists’ movements in the data. Riera and Mateu [50] explain how this indicator has been designed and the data are collected. The DHPI is defined according to a formula wherein (1),

$$DHPI_D = POP_a + \sum_{d=1}^D (A_{da} - D_{da} + w_{da}D_a) \tag{1}$$

where a refers to the year of analysis; D refers to the day of analysis. POP_a stands for the population on 1 January of the year a ; A_{da} represents the total arrivals (per sea and airport) to the Islands, whereas D_{da} represents the departures. D_a is the result of the difference between the year a and the year $a + 1$. Finally, w_{da} is considered the probability of making an error while estimating the arrivals. Figure 6 shows the evolution on $DHPI_D$ within the years 1997 to 2017 for the main Islands Mallorca and Menorca.

The DHPI shows a high seasonal behaviour, with maximum peaks during summer, as the tourism in Balearic Islands is closely related to weather conditions [48]. An in-depth analysis of the indicator can reveal that the seasonality of electrical demand and DHPI are closely related. This point permits the DHPI to be integrated as part of an electricity demand model.

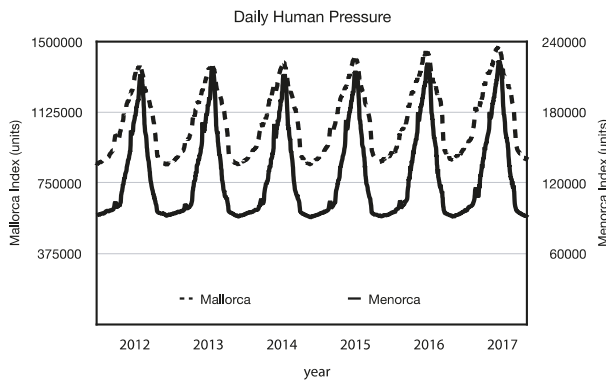


Figure 6. Daily human pressure index in Mallorca and Menorca. Source: IBESTAT.

4. Model Development

Most TSOs use time series to model the behaviour of the electricity demand and price. This kind of tools have turned out to be very powerful as they provide very accurate predictions, although sometimes they are complex. Time series use the observed data in the past to fit a model, and later predict new values. Weron [51] gathers the state of the art of the techniques used for this purpose [52]. This author organises the forecasting methods in statistical methods, artificial intelligence and others. For the first group, representative methods are ARIMA models, exponential smoothing, including Holt–Winters methods, state space models and AR-models. The second group includes neural networks and support vector machines. Some other naïve methods are also available; however, their use is minor. TSOs usually develop their own models as a combination of all the former. In Spain, REE uses its own model in which 24 hourly subsets are forecasted each hour, and there is a daily forecast for medium-term purposes [53,54]. This model is based on the decomposition, for each hour of demand, in basic load (where trend and seasonality are included) and load modifiers due to special days or climatic factors. The basic load is adjusted to an ARIMA time series model, while the modifiers are dummy variables. Usually, TSOs do not publish their own forecasting models; they use a combination of several time series techniques, as described by Suganthi [55]. Electricité de France developed its own model based on regression models and Fourier decomposition of the seasonality [56,57], whereas TERNA (Italy’s TSO) uses a model more similar to REE’s [58,59].

This paper focuses on Holt–Winters’ methods, as they are very efficient in electricity demand forecasting, due to their simplicity and accuracy on time series with a strong seasonal effect [60].

4.1. Basic Holt–Winters Methods

The Holt–Winters exponential smoothing methods (HW) were introduced by P.R Winters [61] in the 1960s. These methods consist of several smoothing equations, which model the level, trend and seasonal components in the observed data. A final equation uses the information of smoothing equations to provide forecasts, and thus, it is named forecasting equation. In all models, there is at least one level equation. The other equations can be avoided if no trend or no seasonality is considered. Equations (2)–(5) show the Holt–Winters model.

$$L_t = \alpha \left(\frac{X_t}{I_{t-s}} \right) + (1 - \alpha)(L_{t-1} + T_{t-1}) \quad (2)$$

$$T_t = \gamma(L_t - L_{t-1}) + (1 - \gamma)T_{t-1} \quad (3)$$

$$I_t = \delta \left(\frac{X_t}{L_t I_{t-s}} \right) + (1 - \delta)I_{t-s} \quad (4)$$

$$\hat{X}_{t+k} = (L_t + kT_t)I_{t-s+k} + \phi_{AR}^k \varepsilon_t \quad (5)$$

where L_t is the level equation with a smoothing parameter α , T_t stands for the trend equation, with smoothing parameter γ and I_t is the seasonal indices of cycle length s and smoothing parameter δ . X_t is the observed data whereas \hat{X}_{t+k} is the k -ahead predictions; ϕ_{AR}^k is the adjustment factor related to the first autocorrelation error (ε_t). Gardner et al. [62] and latterly Taylor [63] include a damping factor in the trend. Williams and Miller [64] propose a new model in which interventions are modelled as level adjustments. The most important evolution is introduced by J.W. Taylor by including the double [65] and triple seasonal [66] Holt–Winters (HWT), and an adjustment using the first autocorrelation error (AR1), that improves the forecasts [67]. Trull et al. use discrete-interval moving seasonalities to model Easter holidays [68].

The equations in the model can be combined using different methods: additive and multiplicative. The previous methods used an additive method for trends, while seasonal indices were included using a multiplicative one. García-Díaz and Trull [69] generalise these methods to n seasonalities and apply them using three factors followed by the seasonal cycle length. The first factor stands for the

trend method, the second for the seasonal method, and the third describes whether the model has been adjusted with AR1. Table 1 summarises all possible combinations. As an example, a 24 h-length multiplicative trend, multiplicative seasonality including AR1 adjustment will expressed as MMC₂₄.

Table 1. Summary of Holt–Winters (HWT) method combinations.

Trend \ Seasonality	None	Additive	Multip.	None	Additive	Multip.
	Normal			AR(1) Adjusted		
None	NNL	NAL	NML	NNC	NAC	NMC
Additive	ANL	AAL	AML	ANC	AAC	AMC
Damped Additive	dNL	dAL	dML	dNC	dAC	dMC
Multiplicative	MNL	MAL	DML	MNC	MAC	MMC
Damped Multiplicative	DNL	DML	DML	DMC	DAC	DMC

The parameters are obtained through an optimisation algorithm, by minimising the error of a one-step-ahead forecast compared to observed values. The Holt–Winters methods are recursive; it is thus mandatory to obtain at the beginning the initial values of each model. The level was obtained as the moving average of the first two cycles. The trend was calculated by averaging the difference between the first and the second cycle. The seasonal indices were obtained by dividing each value of the first cycle by moving average. The minimisation algorithm is then launched, with the smoothing parameters bounded between 0 and 1. The root of the mean of the squared error (RMSE) is used to measure the error. RMSE is defined in Equation (6).

$$RMSE = \sqrt{\frac{1}{m} \sum_{t=1}^m (\hat{X}_t - X_t)^2} \tag{6}$$

where *m* is the number of observed values in the time series used to fit the model.

4.2. New Holt–Winters with the DHPI Model

The first autocorrelation error obtained during the model fit, as a result of the optimisation, reflects the variability of the series itself, but also could be related to another exogenous variable. The addition of the AR1 adjustment improves the forecasting accuracy, but some information could be lost. The innovation proposed in this paper consists in splitting this error into two components: one due to the effect of the variability by tourism indicators and the other due to the variability of the series itself. It is possible to perform this action because, as explained in the introductory section, the energy use of the Balearic Islands is highly related to tourism; it is also geographically aisled.

The air temperature is an exogenous variable that is commonly integrated into the model(s) used [70], but, for very short-term forecasting, it is not necessary. The demand itself captures the temperature transitions [71]. Only abrupt changes in the climate conditions could have influence on the model; however, the temperature in Balearic Islands is relatively smooth and thus can be considered constant. In the same way, GDP is a variable that must be kept out of the model. While it may have influence in the long term [72], it is not possible to include it in the model. The series correspond to the aggregate demand of all energy of the islands, and not only that related to tourism. However, the fact that tourism has such a high percentage of GDP means that demand must be associated with tourism components, such as the DHPI, contrary to other places where the weight of tourism is not so high, and its effect is diluted among other sectors. A good sample is the peninsula, where the industrial sector exerts its influence.

The procedure to integrate the indicator in the model was as follows: First, we obtained a simple Holt–Winters model for the DHPI without AR1 adjustment, as the error will be used in the main model.

We used the Holt–Winters model for DHPI because the time series shows a high seasonal component and is proportional to the demand model. The DHPI model is described by Equations (7)–(10).

$$L_t^{DHPI} = \alpha_{DIPH} \left(\frac{DHPI_t}{I_{t-s}^{DHPI}} \right) + (1 - \alpha_{DHPI}) (L_{t-1}^{DHPI} + T_{t-1}^{DHPI}) \tag{7}$$

$$T_t^{DHPI} = \gamma_{DHPI} (L_t^{DHPI} - L_{t-1}^{DHPI}) + (1 - \gamma_{DHPI}) T_{t-1}^{DHPI} \tag{8}$$

$$I_t^{DHPI} = \delta_{DHPI} \left(\frac{X_t^{DHPI}}{L_t^{DHPI} I_{t-s}^{DHPI}} \right) + (1 - \delta_{DHPI}) I_{t-s}^{DHPI} \tag{9}$$

$$\hat{X}_{t+k}^{DHPI} = (L_t^{DHPI} + kT_t^{DHPI}) I_{t-s+k}^{DHPI} \tag{10}$$

where L_t^{DHPI} , T_t^{DHPI} and I_t^{DHPI} are the equations for level, trend and seasonal indices with smoothing parameters α_{DIPH} , γ_{DHPI} and δ_{DHPI} for the DIPH. \hat{X}_{t+k}^{DHPI} are the k-ahead prediction values for DHPI. The error made by the forecasts of (10) is a very important information. The model defined by (2)–(5) does not react to forecasts produced by (10) because that information is latent in the model. However, a big difference between the forecast of (10) and DHPI means a special situation, that the model (2)–(5) cannot adequately describe or account for. We tried using covariates, as explained by Bermúdez [73], but the results were not positive. The way to relate mismatches in the both forecasting equations—demand and DHPI—is through a linear combination, as shown in (11).

$$\hat{X}_{t+k} = (L_t + kT_t) I_{t-s+k} + \phi_{AR}^k [\varepsilon_t - \rho(\hat{X}_{t+k}^{DHPI} - DHPI_{t+k})] \tag{11}$$

Here, ρ is the relation factor between both models. The complete model is thus expressed as in Equations (12)–(19).

$$L_t = \alpha \left(\frac{X_t}{I_{t-s}} \right) + (1 - \alpha)(L_{t-1} + T_{t-1}) \tag{12}$$

$$T_t = \gamma(L_t - L_{t-1}) + (1 - \gamma)T_{t-1} \tag{13}$$

$$I_t = \delta \left(\frac{X_t}{L_t I_{t-s}} \right) + (1 - \delta)I_{t-s} \tag{14}$$

$$L_t^{DHPI} = \alpha_{DIPH} \left(\frac{DHPI_t}{I_{t-s}^{DHPI}} \right) + (1 - \alpha_{DHPI}) (L_{t-1}^{DHPI} + T_{t-1}^{DHPI}) \tag{15}$$

$$T_t^{DHPI} = \gamma_{DHPI} (L_t^{DHPI} - L_{t-1}^{DHPI}) + (1 - \gamma_{DHPI}) T_{t-1}^{DHPI} \tag{16}$$

$$I_t^{DHPI} = \delta_{DHPI} \left(\frac{X_t^{DHPI}}{L_t^{DHPI} I_{t-s}^{DHPI}} \right) + (1 - \delta_{DHPI}) I_{t-s}^{DHPI} \tag{17}$$

$$\hat{X}_{t+k}^{DHPI} = (L_t^{DHPI} + kT_t^{DHPI}) I_{t-s+k}^{DHPI} \tag{18}$$

$$\hat{X}_{t+k} = (L_t + kT_t) I_{t-s+k} + \phi_{AR}^k [\varepsilon_t - \rho(\hat{X}_{t+k}^{DHPI} - DHPI_{t+k})] \tag{19}$$

In order to exploit the model, variables should match on the resolution. Electricity demand is provided hourly, while DHPI is daily. This discrepancy is solved by using 24 hourly models for electricity demand, one for each hour, that share the same DHPI. That is, we used 24-h models to forecast every day.

5. Results

In order to check the effectiveness of the new proposed model, we tested all methods in Table 1. An analysis was carried out, in which the forecasts for the electricity demand for Mallorca and Menorca were validated. We split the available data into two subsets: we used 90% of the observed values to fit

the models and obtain the parameters, and the rest to perform an out-of-sample validation, making forecasts and comparing with real values.

To obtain the new parameter ρ , we tested two different methods, as it was not clear which one could be more efficient:

1. two-step process, where both models were fit separately to obtain the parameters. Then, parameters were combined to obtain ρ .
2. The DHPI was initially fit, as the electricity demand model requires its error. After obtaining DHPI parameters and error, the complete model is simultaneously adjusted, including ρ .

The forecast accuracy for m-ahead forecasts was measured using the Mean Average Percentage Error (MAPE) defined in (20).

$$MAPE = \frac{1}{m} \sum_{t=1}^m \left| \frac{X_t - \hat{X}_t}{X_t} \right| \cdot 100 \tag{20}$$

The validation process of the method consists in making forecasts for a specific horizon, and comparing them with the real data obtained a posteriori during a period. This period is chosen according to whether it is sufficiently representative [74,75]. We used a forecast horizon of 24 h (typical for the short-term forecasting) during a period of 7 days, as tourists’ average stay in the Island is about 8 days (source: IBESTAT). The analysis compared the MAPE obtained using the basic model against the new proposal. The average improvement obtained for Mallorca and Menorca is summarized in Table 2. Although all methods in Table 1 were tested, only the most relevant are shown in Table 2. The new proposal outperforms the basic model as it reduces MAPE. The best results are obtained in Mallorca, as the tourist population is much bigger in Mallorca, as is its influence on the results. Additionally, we decided to apply for further analysis the all-in-one method as it outperformed the two-step one.

Table 2. Forecast comparison of the new proposal against the standard method. Average reduction of the hourly MAPE% for 7-days-ahead forecasts in Mallorca and Menorca.

	Mallorca		Menorca	
	2-STEP	ALL-IN-ONE	2-STEP	ALL-IN-ONE
AMC	−0.06	−0.12	−0.03	−0.02
AAC	−0.05	−0.10	−0.03	−0.03
NAC	−0.05	−0.09	−0.03	−0.03
NMC	−0.06	−0.11	−0.03	−0.03

Based on the former results, we focused the analysis on the Mallorca electricity demand, and we built Table 3. It shows an hourly split of the MAPE improvement against the basic model. The main improvements are produced during the central hours of the day. These results might be indicating the relation between the energy consumption and tourists’ activity. Our results indicate that the proposed model can reach an improvement of 0.3% in MAPE. This results in an estimated reduction of 200 kg CO₂/hour.

Figure 7 shows a comparison chart for a random day between the demand forecasts given by the regular HW model and the proposed new model. It is appreciated as the new proposal outperforms the results, and approaches the real demand. This graph shows how the introduction of the DHPI acts in the model, bringing the forecast closer to the real demand compared to the regular model. In any case, it is a random example, and at other times the result may be different, although on average the improvements indicated in Table 3 will be obtained.

Table 3. Hourly MAPE reduction in the electricity forecasting for Mallorca. A comparison among the selected models.

Hour	AMC	AAC	NAC	NMC
1	0.0	0.0	0.0	0.0
2	-0.1	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0
7	-0.1	-0.1	-0.1	-0.1
8	-0.3	-0.2	-0.2	-0.3
9	-0.2	-0.2	-0.2	-0.2
10	-0.1	-0.1	-0.1	-0.1
11	-0.1	-0.1	-0.1	-0.1
12	-0.2	-0.1	-0.1	-0.2
13	-0.1	-0.1	-0.1	-0.1
14	-0.1	-0.1	-0.1	-0.1
15	-0.1	-0.1	-0.1	-0.1
16	-0.2	-0.2	-0.2	-0.2
17	-0.2	-0.2	-0.2	-0.2
18	-0.3	-0.2	-0.2	-0.2
19	-0.2	-0.2	-0.2	-0.2
20	-0.2	-0.2	-0.2	-0.2
21	-0.2	-0.2	-0.2	-0.2
22	-0.1	-0.1	-0.1	-0.1
23	0.0	0.0	0.0	0.0
24	-0.1	-0.2	0.0	0.0

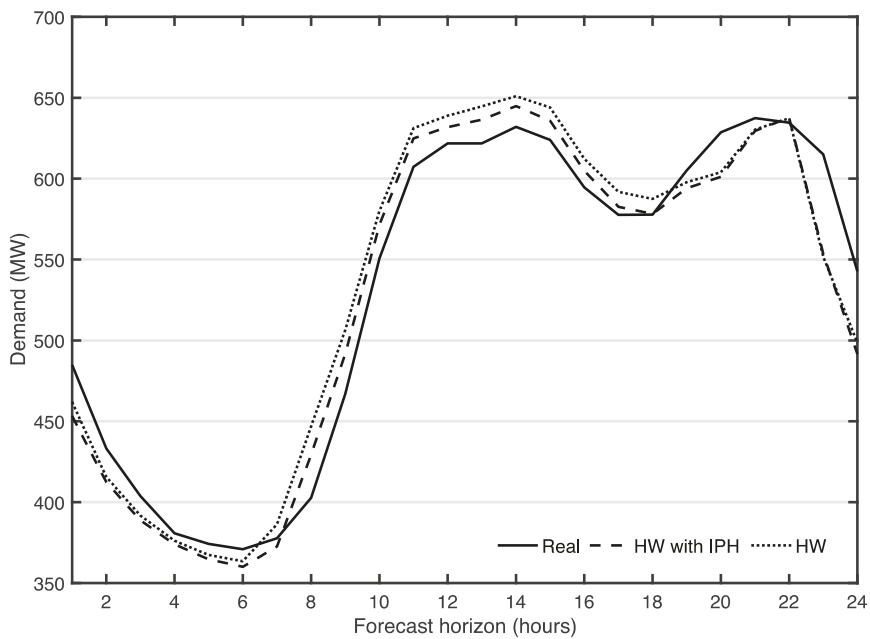


Figure 7. Comparison of one-day-ahead forecasts using the HW method and the new proposed HW-IPH, against the real consumption.

6. Conclusions and Limitations

Tourism has been a powerful tool for local destination development, however social concern about its environmental impact is raising questions about the overall benefits of touristic activities at a local level [76]. The associated environmental costs related to the tourism industry have a broad scope that needs specific approaches [3].

In this paper, we work on the reduction of the environmental impact due to the electricity consumption. More specifically, we focus on electricity demand forecast. The aim of electricity prediction improvement is to reduce the economic and environmental impact caused by forecast errors on electricity demand. Particularly, the environmental impact due to the generation of greenhouse gases has been continuously increasing, despite the policies carried out to increase renewable energies [19]. This effect, in the electricity system, is caused mainly by the generation structure. The generation system uses coal and diesel power plants to adapt to the demand. Demand errors increase the production of these power plants and consequently, the pollution.

We followed Cardenas and Roselló [5], introducing the Daily Human Pressure Indicator, which relates the arrivals and departures of passengers on a daily basis. Previous findings about the relation of energy consumption with tourism pressure [29,32], a higher electricity consumption elasticity in touristic areas [32] and the greater portion of the total electricity consumption due to tourism activities suggested the use of tourism indicators to improve the electricity forecast in tourism areas. Then, the introduction of DHPI makes sense in a context where tourism-related activities represent a large portion of the local GDP. We analyse the demand and its relationship with tourism in the Balearic Islands where tourism accounts for up to 45% of the GDP. Data indicates that electricity demand time series are highly affected by the tourist variation. Thus, we developed a new model using DHPI to improve forecasts. We present a new electric demand forecast model using the Holt–Winters model. We checked the effectiveness of the new model using the data provided by REE and IBESTAT. The results indicated that the model improves demand predictions up to 0.3% in MAPE. This improvement would allow the TSO plan and supply a larger amount of the electricity from sustainable sources and its impact would be equivalent to a reduction in CO₂ emissions of around 200 Kg/hour.

Our study contributes to uncover the benefits of using relevant indicators related to the dominant economic activity in an area to improve the electricity consumption forecast. The results have relevant implications to TSO providers and policy makers. TSO providers might improve the electric consumption forecast at a local level with data sources outside the electricity sector. Policy makers might encourage the data exchange between public institutions and TSO to improve the forecast and reduce the environmental impact. Moreover, policy makers might use information from electricity consumption and tourism activity to evaluate the impact of environmental policies and actions taken in a touristic area.

The analysis of this model has been limited to the Balearic Islands, in which tourism accounts for a large portion of the GDP and DHPI is easily associated with the electricity demand as it is calculated by the human arrival to and departure from the islands by sea or by air. The use of these indicators in other tourist destinations might be limited by the number of these visitors accessing the area by other means, such as car or train. However, this might be an interesting path for specific destinations where tourist flow is easily controlled and the electrical balance is controlled by fossil fuel power plants. Future research will have to verify this model in other similar tourist destinations, such as the Canary Islands, to strengthen our conclusions.

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Article

Evaluating Sustainable Purchasing Processes in the Hotel Industry

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Abstract: Managing sustainability along the supply chain has gained significant relevance in recent years, in both academic and business environments. The aim of this research paper is to describe and evaluate the degree of implementation of sustainable purchasing (SP) in the supply chain of the hotel sector in Spain, as well as to identify the main drivers and barriers to effective implementation. This is done from the double perspective of hotel chains and suppliers (industrial laundries). An exploratory and inductive qualitative methodology has been adopted, consisting of (a) observation; (b) collection, review, and analysis of primary sources; and (c) in-depth interviews with 15 managers of hotel chains and suppliers. This triangulation of data sources provides validity and credibility to the results and reduces any potential bias. Evidence is found to support that SP is at an early stage of implementation in the hotel sector in Spain, with big differences among companies. The results suggest that the main drivers and barriers to effective implementation are final customers, governments, market conditions, management commitment, and conflicts in customer/supplier interests. The authors propose a new classification of companies based on the size, type, and degree of implementation of SP.

Keywords: sustainability; purchasing; supply chain; qualitative methodology; hotel industry

1. Introduction

The concept of sustainability has gained great relevance in recent years, in both academic and business environments. The World Commission on Environment and Development [1] (p. 8) defined sustainability as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” Sustainability management implies that companies should consider the impact of their actions not only on economic aspects, but also on environmental and social ones [2]. All stakeholders (clients, governments, organizations, workers, communities, suppliers, etc.) are increasingly exerting pressure on companies to put in place policies that ensure compliance with sustainability objectives from these three perspectives. Having good or bad performance in these aspects has a very significant impact on the image of the company and might bring relevant consequences.

However, compliance with sustainability criteria should not be considered solely within the company itself, but must go beyond its boundaries, throughout the entire supply chain in which it operates. It is not enough for a company to comply within social and environmental fields; its suppliers must also comply with it, since if the management of its suppliers is not adequate, the company's reputation might be damaged to a large extent, and its level of performance might also be impacted [3,4]. In recent years there have been cases in which this has occurred with companies such as Mattel, Nike, and Dell [5–8].

Therefore, it is the responsibility of companies to ensure that they manage their supply chain in a sustainable way. Despite the fact that sustainability is increasingly emerging in companies' supply chain practices, especially in multinational enterprises [9–12], corporate initiatives to implement sustainable purchasing (SP) are still scarce, disordered, and not well anchored on strong motivations to exert sustainable behaviors and to disclose trustworthy and accurate information about them [13,14]. Moreover, the extent of deployment and integration of these policies differs significantly depending on the business sector and the type of company [15]. Stakeholders increasingly have higher expectations for companies to adopt effective SP policies towards all suppliers with whom they work [16]. There is still a great distance between the society and community expectations and reality, and this occurs both in private and public corporations [10].

Sustainability in supply chain management (SSCM) has not been addressed in a holistic and comprehensive way. First, attention has been paid mainly to environmental issues, leaving wide room to attempts aimed at understanding the social side of supply chain sustainability [16–18]. Second, most studies adopt an instrumental—“what-do-I-earn-if-I-act-sustainable”—approach limiting the understanding of SSCM to cause-effect and reactive-to-compliance understandings [16,19,20]. And third, research has focused mainly on the sustainability of downstream supply chain; consequently, upstream sustainable practices remain insufficiently addressed [19,21,22].

Thus, there is a need to strengthen and reorient research on SCM sustainability [16,23–26], and in particular, the purchasing function, which has a greater environmental bias [10,25,27–29]. In part, this bias is due to the different emphasis required by the environmental dimension, focused on the product and all stages of its life, and the social dimension, with greater emphasis on the supplier and the conditions around the production process [10,25].

Top management appears to be one of the most relevant drivers of the implementation of the purchasing function, so it is necessary to better and more thoroughly define the exact role to be played by top management. On the one hand, managers might send a clear message of responsibility to the organization and thus motivate responsible purchasing practices. According to Espino-Rodríguez [30], “the application of operations policies and practices has a short-term effect on non-financial performance, measured as the satisfaction of stakeholders (customers, tour operators, and employees), and a possible long-term effect on financial performance (e.g., return on assets, profit margins, occupancy)” in the hotel industry in Spain. On the other hand, managers might not authorize expenditures for, or investment in, responsible purchases, thus saving funds for future projects. As research has found that cost is the main barrier, these behaviors can simply be a sign of the low priority given to the role of responsible purchasing by senior management [4].

This is also applicable to the tourism sector in Spain, and more specifically to the hotel industry, one of the sectors with a high impact on the country's economy, whose companies, as in any other industry, are called to be responsible. When assessing the way in which they address sustainability, we can see that the situation is less developed than that of other sectors: There is some activity from both the academic and business practice points of view, with the aim of implementing sustainability aspects and policies in large companies in the sector. However, most of them focus more on the environmental aspect (new designs of facilities, energy efficiency, and waste management, primarily). There are some non-academic publications and editions of documents issued by companies, sectoral associations, consultancies, or other groups of interest. Examples of this type of document could be their codes of conduct, annual company reports, or sustainability reports, and specific initiatives that lead to recognition awards by the sector, etc. In the last sectoral meetings, several initiatives were presented and seminars were developed to raise awareness of the need to address the concept of sustainability as a strategic pillar. These initiatives are led by some companies, associations, the administration, and specific organizations, and in general they are more oriented toward environmental aspects. Examples of this type of document could be national tourism plans, those derived from programs and sessions at international fairs such as FITUR (Feria Internacional de Turismo, Madrid, Spain), or initiatives by the World Tourism Organization.

Regarding the responsible management of the supply chain in this sector and, particularly, incorporating sustainability within the purchasing function, it is noted that activities and literature are scarce and in their earliest stages, from both the academic and non-academic point of view.

The objective of this research paper is to describe and evaluate the degree of implementation of SP in the supply chain of the hotel sector in Spain. This is done from the double perspectives of customers (hotel chains) and suppliers (industrial laundries). More specifically, the purpose of this paper is threefold: First, to evaluate how companies in this sector follow the proposed models and frameworks from the literature; second, to identify the main drivers and barriers to effective implementation; and third, to determine whether a taxonomy of companies with different purchasing categories can be proposed based on previous findings.

An exploratory and inductive qualitative methodology was followed, consisting of (a) observation; (b) collection, review, and analysis of primary sources; and (c) in-depth interviews. In-depth interviews were conducted with 15 managers of client and supplier companies (hotel chains and industrial laundries), providing the authors with a reliable view of what is happening in this sector. The information obtained through observation and primary sources was completed, confirmed, and consolidated. This triangulation of data sources provided validity and credibility to the results and reduced any potential bias.

Evidence has been found to support that SP is at an early stage of implementation in the hotel sector in Spain, with big differences among companies. The results suggest that the main drivers of, and barriers to, effective implementation are final customers, governments, market conditions, management commitment, and conflicts in customer/supplier interests. The same factors may act as drivers or enablers when they help or support effective implementation, or as barriers when they hinder it or make it difficult. The authors propose a new classification of companies based on the size and type of corporation and degree of implementation of SP. This study also proposes an implementation model, as well as a list of initiatives and proposals for industry managers and policy makers.

The paper has been organized as follows: Section 1 is the introduction; Section 2 refers to the literature review; Section 3 describes the methodology and materials; Section 4 presents the results; Section 5 is the discussion.

2. Literature Review

One of the main research concerns in tourism has been customers' sensitivity toward sustainability as a development driver of the industry [31–36]. However, many studies have revealed that the industry is reacting slowly to this need despite the growing global relevance of sustainability in business [37–39]. Explanations for this can be found in a "lack of collective leadership amongst tourism's stakeholders" and in the so-called environmental paradox of the industry: Whereas natural resources are key characteristics of tourist destinations, such resources are at the same time sacrificed to satisfy a growing demand [39].

The large amount of studies published on sustainability in the hotel industry reveals a wide variety of approaches and matters of research in this field [40]. Previous works have mainly addressed the design of more ecological and efficient hotels, the reduction of water and energy consumption, technological innovations to improve sustainability, and progress in workforce management. Consumers' satisfaction with hotels' sustainable practices is another concern that has received much attention [41–46].

Other works have addressed the role of management systems for sustainability [47] and, particularly, the aspect related to "reporting practices" [48,49]. De Grosbois [50] analyzed the methods and scope of corporate social responsibility (CSR), reporting on 150 of the world's leading hotel chains. He pointed out that, although many of them reported their commitment to and objectives for aspects of environmental and social sustainability, few detailed specific initiatives were developed or results achieved. Regarding environmental practices, reporting on EMS—i.e., corporate policies, assessments, plans, and actions directed to define the company relationship with the natural environment—has gained significant weight in the promotion of more sustainable supply chain practices since it can lead

to gain international accreditation of best practices. Such accreditation is granted if EMSs actually comply with the International Organization for Standardization (ISO) 14,001 and 14,040 standards, or with the European Eco Management and Audit Scheme (EMAS) standard [11,51,52]. Research has shown that, compared to manufacturing companies, service ones—such as hotels—are more confident in the benefits of having environmentally accredited supply chain practices [11].

Looking specifically at the case of the Spanish hotel industry, the work of Molina- Azorín et al. [53] offers an empirical analysis of the impact of sustainability practices on firm performance, highlighting how the environmental management of hotels can reduce their costs and increase their returns. In this sense, on the one hand, they identify, through regression analysis, those practices with the greatest impact on a series of variables related to performance. On the other hand, through a cluster analysis, they identify three groups of hotels (proactive, basic, and reactive) based on their proactivity in environmental management practices, showing significant differences in performance between them. “Environmentally proactive” refers to hotels with the most developed environmental strategies, including higher-category hotels usually affiliated with a hotel chain. The second group, basic, includes hotels with a basic environmental commitment. It is the largest group, and is characterized by its three-star, independent, above-average sized hotels. The third group, reactive hotels, have a low environmental commitment, usually three-star, independent, small hotels. Eco-labels are strong indicators of the environmental practices of companies, they help build an image in consumers’ minds and to prevent confusion about the actual company environmental behavior [54]. In the hotel industry, the European eco-label requires the compliance with a number of provisions and conditions, some of them referring particularly to holding a green supply chain: The use of eco-labelled products in their service supply; integrated environmental values in the operations management, and initiatives for reducing the use of energy and the creation of waste. Like environmental regulatory standards, the use of eco-labels promotes environmental practices since they are perceived by hotels to be accompanied by economic benefits, competitive and commercial [55].

Rodríguez-Anton et al. [47] analyzed the use of sustainability management systems in the Spanish hotel industry, looking empirically at their existence as well as their scope, sequence of implementation, and possible integration of different standard management systems.

Despite some notable efforts to crystallize and systematize conceptual frameworks for sustainability in the hotel sector (first by Clarke [56], and recent studies [38,40,57,58]), this apparent richness and dynamism that characterizes the academic literature includes weaknesses, such as a fragmentary nature and the lack of a coherent structure or clear framework of analysis, and the need for consensus on priorities for future research agendas [40], the identification of more consistent methodological approaches, and the development of appropriate measurement scales [58].

On the other hand, in relation to the hotel sector, more scholars have pointed out that academic research should integrate the three aspects of sustainability (economic, social, and environmental) with a holistic approach [3,50], in addition to developing a deeper understanding of sustainability specifically related to SCM [59–63]. In this sense, it is worth highlighting the work of Zhang et al. [64], who present a review of the literature related to SCM in the context of tourism, as well as the work of Xu and Gursoy [65], who present a conceptual framework for sustainable hospitality SCM and start a discussion about the impact on customers’ satisfaction, loyalty, and willingness to pay extra. They present “five critical aspects including the actions, motivators and inhibitors, company characteristics, the evaluation approaches, and the impacts.” Sustainable hospitality SCM can be defined as “the management of material, products, services, and cooperation and coordination among organizations in the hospitality supply chain to achieve three objectives of sustainable development: environmental, social, and economic sustainability” [65].

Carter and Jennings [66] proposed a new concept, purchasing social responsibility, along with its specific activities and drivers, developed through a review of the CSR and related purchasing and SCM literature and an integration of extant findings from in-depth interviews with supply chain managers. Hollos et al. [67] examined the effects of sustainable supplier cooperation on firm performance. Through

an empirical study based on a survey in Western European countries, they conclude that sustainable supplier cooperation has generally positive effects on firm performance across the three dimensions of sustainability. However, only environmentally friendly practices have positive and significant effects on economic performance.

In this same direction, but with empirical research specifically focused on the European hotel industry, Kassinis et al. [68] explored, through a structural equation model, the nature of the relationship between environmental management practices on the “external portion of the service profit chain” and performance. Particularly, they show that the use of environmental practices in service companies is positively related to performance through the mediating effect of greater consumer satisfaction and loyalty.

The literature includes some efforts to offer a frame of general validity for managers on the dimensions and motivational factors of responsible supply [66], or for the understanding of trans-sectoral models of sustainable SCM, and propose schemes of general application [25,69–72]. These frameworks or models can be of a different nature, depending on whether they: (i) Refer globally to sustainable SCM or focus more on the purchasing function; (ii) can refer to a specific aspect within this function or to the implementation process; or (iii) identify the factors that influence an adequate implementation or not. However, each author identifies different stages and key success factors for an adequate SP implementation process. Mamic [23], for example, indicates that the common elements of these integrated models generally cover the following four areas: (a) Development of a vision; (b) understanding of that vision by employees and suppliers; (c) implementation; and (d) monitoring, feedback, and improvements.

In addition, none is conceived or presented as a decision model for the company that allows weighing advantages and disadvantages of alternatives or their adaptation to different business contexts and strategies. Nor is there a model that combines stages with obstacles to, and drivers of, each stage or that describes the influence of different stakeholders in each stage. However, Maloni and Brown [5] consider that each sector or industry has sufficiently significant peculiarities to require the development of independent sector studies that adapt the risks, priorities, and management models specific to each industry. Additionally, we find that the literature has scarcely examined the relationship of SP with the size of the company: Fassin [73] warns that studies tend to focus on the relationship between transnational corporations and their suppliers in less developed countries; thus, these studies pay little attention to the role and particularities of small and medium enterprises.

The literature related to different models or theoretical frameworks on SP implementation processes has been reviewed [3,7,23,25,27–29,66,67,69–72,74–86]. A summary of the findings is presented in Table 1, with details about (1) scope (P for purchasing function, SCM for supply chain management); (2) whether it is a real implementation model, with all stages clearly identified and described; (3) whether it identifies factors (drivers and barriers) for implementation; (4) whether it is just focused on one stage (e.g., supplier assessment or implementation of code of conduct); (5) whether it is a decision tool; and (6) whether it refers to a specific sector (S) or a geographic area (G).

Table 1. Summary of sustainable purchasing (SP) implementation models from the literature.

Authors	Date	Description	1	2	3	4	5	6
Carter and Jennings	2004	Purchasing role in CSR	P		✓			
Mamic	2005	Global SCM	SCM		✓	✓		S
Teuscher et al.	2006	Framework for sustainability in SCM	SCM		✓			
Vermeulen and Ras	2006	The Challenge of Greening Global Product Chains: Meeting Both Ends	SCM		✓			S, G
Svensson	2007	Conceptual framework and empirical example	SCM		✓			S
Carter and Rogers	2008	Framework for sustainability in SCM	SCM		✓			
Seuring and Müller	2008	Theoretical framework for sustainability in SCM	SCM		✓			

Table 1. Cont.

Authors	Date	Description	1	2	3	4	5	6
Vurro et al.	2009	Model classification according to network determinants	SCM					
Björklund	2010	Benchmark tool for CSR in purchasing	P	✓	✓		✓	G
Hietbrink et al.	2010	CSR in purchasing function	P		✓			
Leire and Mont	2010	Implementation model for socially responsible purchasing	P	✓	✓		✓	G
Dai and Blackhurst	2012	Four-phase AHP-QFD approach for supplier assessment	P		✓	✓	✓	
Wolf	2011	Integration of sustainable SCM in German manufacturing industry	SCM		✓	✓		S, G
Giménez and Tachizawa	2012	Extending sustainability to suppliers	SCM		✓	✓		
Perry and Towers	2013	Conceptual framework for implementation of SCM	SCM		✓	✓		S, G
Vargas and Moreno	2013	Efficient and SP management	P		✓			G
Azadnia et al.	2015	Sustainable supplier selection and order lot-sizing	P		✓	✓	✓	
Atkin and Gergin	2016	Mathematical modeling of sustainable procurement strategies	P		✓	✓	✓	
Prier et al.	2016	Practices on sustainable public purchases	P		✓	✓		S
Carbone et al.	2012	Diffusion of sustainable SCM toward a conceptual framework	SCM		✓			
Hollos et al.	2012	Examining whether sustainable supplier cooperation affects performance	P		✓			G
Kirce and Seifert	2015	Dynamic capabilities in sustainable SCM theoretical framework	SCM		✓			S
Ahmad et al.	2017	Integrative framework for sustainable SCM practices in the oil and gas industry	SCM	✓	✓			S
Tavana et al.	2017	Hybrid goal programming and dynamic data envelopment framework	SCM			✓	✓	S, G
Abduh et al.	2018	Development methodology for sustainable procurement of construction works in Indonesia	SCM		✓			S, G
Prasad et al.	2018	Analyzing the critical success factors for implementation of sustainable SCM: Indian case study	SCM		✓			S, G

Notes: 1. Scope: Purchasing function (P), supply chain management (SCM); 2. Real implementation model, with all stages clearly identified and described; 3. Identifies factors (drivers and barriers) for implementation; 4. Just focused on one stage (e.g., supplier assessment or implementation of code of conduct); 5. Decision tool; 6. Specific sector (S), or geographic area (G).

We note that most of the proposed models refer to sustainable SCM generically, without going into detail on the topic of purchasing management, which is the subject of this study. Likewise, the vast majority of the models try to define a general framework, in which proposals are made on the level of interrelationships of various stakeholders and actors in the supply chain and relationship strategies between them. Only two studies [25,76] tried to develop an SP implementation model in which each and every one of the stages for the complete implementation process is presented in a clear and detailed manner, identifying the key decisions of each stage and the success factors. The other models provide very interesting ideas and proposals, and a framework for carrying them out, but they do not take these ideas to all stages of the buying process. Some models refer to the purchasing function, but they focus on a very specific aspect or phase within the SP process. For instance, one model focuses on the development and implementation of codes of conduct; another mathematical model proposes measurement to assess the degree of sustainability of suppliers (so they serve as a tool for decision making on supplier selection). Some refer to specific sectors (manufacturing, textiles, food, footwear, public administration, etc.), or to certain geographical areas in which companies operate (Asia, South Africa, Germany, United States, Colombia, etc.).

Of all the references studied, Leire and Mont [25] propose the most complete model of implementation of the SP function, based on secondary and empirical sources, including interviews with different organizations, which allowed them to validate their conclusions. We chose this model as a basis for our study because it responds more directly to the set of objectives, with a clear focus on the practical implementation of sustainability in purchasing, describing each stage and phase, identifying the responsibilities in these stages and the factors that influence them for adequate implementation. The model is presented as a tool that can help in decision making and is applicable to any sector. The rest of the studied references are not discarded, but they provide good inputs, ideas, and proposals that complement the use of this model. These contributions were used in the preparation of the interview script.

The model of Leire and Mont [25] of implementation of the SP function is based on a process consisting of five stages: (i) Developing internal policies; (ii) setting purchasing criteria; (iii) applying assurance practices; (iv) managing supplier relations; and (v) building internal SP capacity. This model details all the phases in the SP implementation process and how they are connected to each other. It begins with developing internal policies within the organization itself. From there, purchasing criteria are established, particularly the sustainability criteria that must be incorporated in the purchasing process. This is the starting point for the selection of suppliers and the application of control practices and monitoring of suppliers. The relationships with suppliers should not be based solely on monitoring and controlling certain performance indicators; it is essential to take into account other aspects in the management of the relationship. Finally, the model proposes the development of internal capacity for SP management.

Most of the frameworks or models discussed above make good proposals regarding the factors that most influence adequate SP implementation, identifying the drivers that favour its implementation as well as the obstacles or barriers that make it difficult [3,7,10,23,25,27–29,46,66,67,69–72,74,76–83,85,86]. Drivers are classified as internal factors (within the buying company) or external factors (outside the buying company). In the same manner, barriers are classified as internal barriers (within the buying company) or two kinds of external barriers (outside the buying company, and for suppliers). Tables 2 and 3 present a summary of all of them.

Table 2. Drivers of SP implementation.

References	Drivers of Implementation	
[3,7,10,23,25,27–29,46,66,67,69,71,72,76,77,79,82,83,85,86]	Internal factors within the buying company	
	<ul style="list-style-type: none"> • Risk mitigation, and therefore cost reduction. • Vision of the organization, policy, or code of conduct. • A leader in the organization who launched SP initiatives. • Protection of the brand image. • Search for suppliers that share the same values as the organization. • Providing workers with an adequate environment. • Feeling of pride by company workers thanks to its values and practices. • Individual values of purchasing department employees. • For public organizations: Preserving the good name of the region or country. • For suppliers: Working on social issues can expand the customer base. • Size and organizational culture of the company. 	
	[3,10,23,25,29,46,66,69,71,72,76–83,85,86]	External factors outside the buying company
		<ul style="list-style-type: none"> • Expectations of stakeholders, especially nongovernmental organizations (NGOs) and media. • Public opinion. • Compliance with regulations by the government and public administrations. • Maintaining legitimacy in the eyes of stakeholders. • Market and final consumers require more good records on SP practices. • External evaluations and ratios. • Participation in the development of standards on social issues. • Need to report sustainability issues. • For public organizations: Political vision in the region or country. • For public organizations: Decisions of politicians. • Generalized practices in the sector and between competitors. • Differentiating element with respect to the competition. • Involvement of third parties that support the implementation process.

Table 3. Barriers to SP implementation.

References	Barriers of Implementation
	Internal barriers for the buying company
[3,7,10,23,25,66,67,72,74,76,79,80]	<ul style="list-style-type: none"> • Lack of information on how to develop or implement SP policies. • Lack of commitment from senior management, especially in the implementation phases. • Need to justify the activity and its cost based on the benefits it brings to the company. • Significant changes in the buying organization may be required. • Lack of material and resources for staff training due to the specificity of sector/company. • Organizational inertia. • Conflict with short- and long-term interests.
	External barriers for the buying company
[3,10,23,25,28,72,74,76,79,83]	<ul style="list-style-type: none"> • High cost of supplier audits. • Qualification of audit teams: Low-quality risk due to growing competition between audit firms and low prices. • Difficulty in establishing cooperative and long-term relationships with suppliers. • Lack of understanding of the importance of social aspects by suppliers, as well as duplicity of “accounting books” and deception. • Difficulty in influencing beyond level 1 of suppliers and high cost of changing suppliers; complex supply chains, with several levels of subcontracting that are difficult to control. • Employees of suppliers could support current practices (for instance, excessive overtime). • Lack of clear legislation for clients on how to integrate social aspects into the supply chain. • Operations of suppliers with a low level of automation (more labor-intensive operations). • Continuous pressure from the competition to lower prices. • Difficulty in verifying the veracity of the responses of suppliers. • Difficulty in verifying the implementation of action plans carried out by suppliers. • Communication and information problems in the market (to/from customers/suppliers). • Institutional barriers in international trade. • Doubts about the economic situation when making investments.
	External barriers for suppliers
[3,10,25,66,69,70,72,74,76,79]	<ul style="list-style-type: none"> • Customer practices with urgent orders and increasingly shorter delivery times facilitate worse working conditions and lack of attention to safety issues. • Requirements from different clients, increasingly numerous and sometimes contradictory. • Lack of legislation and its reinforcement for suppliers in one or several countries. • Conflict between high levels of performance in sustainability criteria and increasingly reduced margins in products and services. • Difficulties in influencing beyond level 1 of suppliers; complex supply chains, with several levels of subcontracting that are difficult to control. • Time dedicated to preparing audits and inspections. • Trust in relationships.

3. Materials and Methods

An exploratory and inductive qualitative methodology was used, aimed at theory building. It consisted of (a) observation; (b) collection, review, and analysis of secondary sources; and (c) in-depth interviews. This approach is particularly useful when the research needs to answer “how” and “why” questions [87]. Interviews are “a highly efficient way to gather rich, empirical data, especially when the phenomenon of interest is highly episodic and infrequent” [88], as well as in circumstances when (i) there is little documentation; (ii) it is unclear and unstructured, making it difficult to compare and interpret; (iii) the information is only provided from the perspective of the client, not its suppliers; and (iv) it is difficult to contrast whether what is said in the documents corresponds to the reality of what is actually done [89]. The combination of data collection techniques provided validity and reliability to the results and helped to reduce any potential bias.

Observations were based on documented experiences by one of the authors during close to two years working in this industry. Observation and analysis of secondary sources (documents from company websites, industry reports, congress, etc.) showed that information about sustainable business practices is incomplete, scarce, unclear, and hardly comparable. Sustainability issues are

delicate and sensitive, so formal business documents tend to avoid being specific about the company position, initiatives, commitments, and/or future plans. The in-depth interview is a methodology that helps to collect precise and detailed qualitative information and is used when the research problem cannot be completely observed due to ethical or complex issues [90]. We conducted individual in-depth interviews with interlocutors from hotel chains and their suppliers. We then carried out an in-depth category and interpretative analysis of our interviewees' responses.

First, an interview script (see a script summary in Appendix A) based on the literature review was prepared, but issues were reformulated in a language suitable for our interlocutors to understand. The script begins with an introduction to the research project and some general questions about the business context of the company, and then deepens into questions about the implementation of SP policies. The questions are fundamentally based on concepts extracted from the model of Leire and Mont [25], although they also use as reference the rest of the models described in Table 1 in the previous section. Some of the questions were formulated in a very precise way, looking for a concrete answer, and some were done in a more open way in order to encourage the interlocutor to respond more freely. Depending on the interview, new questions could arise to clarify and specify some of the answers.

When determining the number of people to interview, the principle of theoretical saturation was taken into account, which says that the so-called theoretical saturation point is reached when the information collected is enough in relation to the research objectives [91]. For a population under study that is homogeneous, made up of experts in the field of study, and the objectives are well defined, Guest et al. [92] suggest that a sample of 6 interviews is enough to achieve information saturation. A sample of 7 client-type companies (hotel chains) and 6 supplier-type companies (industrial laundries) was determined, for 13 companies in total, but there were 15 interviews. We interviewed 2 managers at 2 of the companies (one hotel chain and one supplier). The reasons for this were that they were both big companies (+300 sites, +20,000 employees), so they have different departments and management positions with knowledge and expertise that could bring very interesting and complimentary inputs to our research (operations vs. sales; corporate sustainability vs. procurement). They were also available and open to share these different views with us.

The selection of companies to interview was carried out in the following way:

- Client companies (hotel chains): We classified the hotel chains into 3 groups (large, medium, and small) based on their size (number of hotels and rooms). Based on Loeda [93], we listed and ordered the hotel groups based on size, and we determined that large group includes the largest 15 hotel chains (representing 30.5% of hotels and 32.8% of rooms in Spain); medium group includes the next 59 hotel chains (representing 33.3% of hotels and 36.2% of rooms in Spain); and finally small group includes the remaining hotel chains (representing 36.2% of hotels and 31.0% of rooms in Spain). Three companies from the large group and two from the medium and small groups were selected according to the following criteria: Recognized companies within the group, with central offices located in the central zone of Spain, and accessible to the management team. In general, all the large hotel chains have centralized procurement departments (CPD), but only some medium and small chains have CPD.
- Supplier companies (industrial laundries): Industrial laundries were selected as supplier for this research because their activity is directly related to the three aspects of sustainability: (a) Their activity has a clear impact on the quality and service that the hotel chains provide to their guests (economic aspect); (b) industrial laundries are labour intensive (social aspect); (c) their production processes require the use and consumption of big quantities of water, energy, chemical products, gas, material (linen), etc. (environmental aspect). A classification of industrial laundries was carried out for 3 groups based on their size and geographical scope of activity. Small companies are not the object of this study. Three medium and large companies were selected.

The interlocutors were carefully selected according to the following criteria: Hierarchical responsibility in the company, ability to make decisions in relations between client and supplier,

experience in the workplace and the industry, and experience and responsibility in the field of sustainability. In the hotel chains, the profiles that met these requirements were purchasing managers, operations managers, and managers in charge of sustainability. In the supplier companies, the profiles that met these requirements were factory managers, commercial directors, and managers.

Some considerations were evaluated in order to guarantee the quality of the information obtained in the interviews, such as their preparation and duration, the selection of the interviewers, the date, the place, and the recording process. The interviews were digitally recorded, with a second recorder as backup. The recording was completed with notes during the interview by the interviewer. This is convenient not only to record the subject's voice, but also to observe the various reactions that occur throughout the interview [94].

The quality of the information obtained in the interviews depends on the collaboration of the interviewees, which entails "serious ethical obligations towards them" [94–96]. That is why informed consent, confidentiality, and consequence documents were prepared and signed, guaranteeing that the information from the interview: (i) Would not be disseminated to third parties; (ii) would only be part of the study in question; and (iii) would be included in this paper in such a way that no data, names, or numbers could help to identify the interviewee or the company.

A methodological field journal was kept, with the aim of recording the process of contact with interlocutors, the conversations that took place before the interviews, the introductory stages, and aspects related to the detailed observation during the interview or during other informal meetings. The purpose of this double recording was to perform a compared analysis with the recorded conversation during the interview session, in order to clarify certain nuances or circumstances. Once the interviews were carried out, they were transcribed within a period not exceeding 48 h. Transcription truthfulness and quality were guaranteed by a second person, who double-checked that the text corresponded authentically with the recordings.

Then, we proceeded to the coding of the transcribed interviews. This consisted of extracting the concepts from the original data and developing them in terms of their properties and dimensions [97], and this was carried out with the support of NVivo software. Initially, coding of the interviews followed a deductive approach: An interview script was elaborated from the research objectives and the theoretical framework, first categories were extracted from it, and the coding process was started (see Figure 1 for categories of analysis). From the transcripts, we continued the coding process, this time inductively: Based on a careful and precise reading of the interviews and the data obtained from them, definitive categories emerged. During this process, the contents were labelled, concepts were identified, and ideas were written down, so they could be used (if considered) to improve the script for the following interviews when rethinking new topics [97]. This codification process was completed with the reading of the field journal, from which ideas, nuances, and interpretations were also extracted that reinforced or questioned the information obtained, providing more solidity to our work.

Once all the resources and interviews were coded, we proceeded to a deep categorical and interpretative discourse and content analysis phase, aimed at interpretation. Discourse analysis was focused on analyzing the words and discourse used by the informants. The words used, the frequency of their use, and their relation to key concepts were studied, always bearing in mind the context of the conversation and the interviewee's profile. NVivo software helped us build cloud marks of word frequency, statistics, and data tables. See Figure 2 for an example of a word frequency cloud mark for hotel chains.

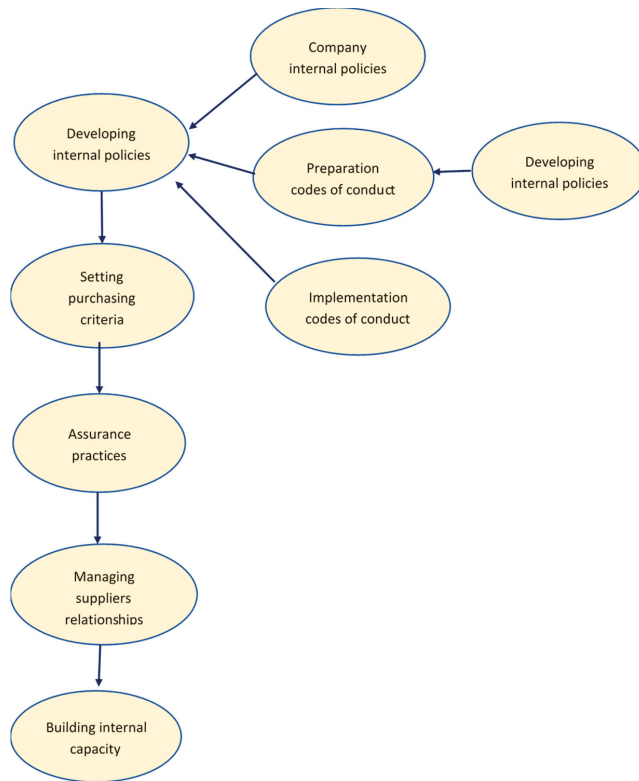


Figure 1. Categories of analysis.



Figure 2. Word frequency cloud mark for hotel chains.

Next, we proceeded to content analysis of the coded categories. For each category, the coded content was evaluated, comparing some interviews with others, information from hotel chains and suppliers, and different segments. Findings were obtained by detecting patterns to the extent that the information was repeated (saturation was achieved) or there were divergences in the discourse. From all this, relationships between the categories and elements were extracted, providing results that helped us to respond to the research objectives. See Figures 3 and 4 for an example of the relationship of categories with each of the resources (interviews).

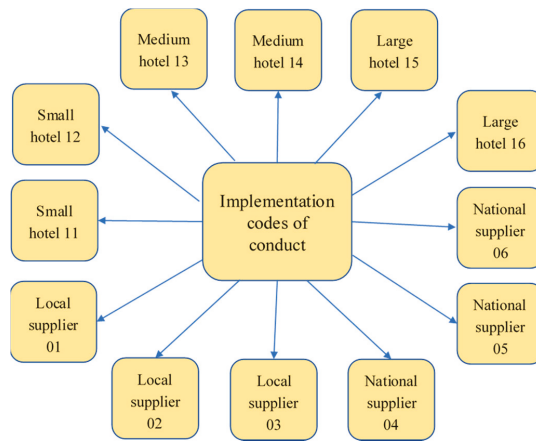


Figure 3. Relationship of categories with resources (interviews). Implementation of codes of conduct.

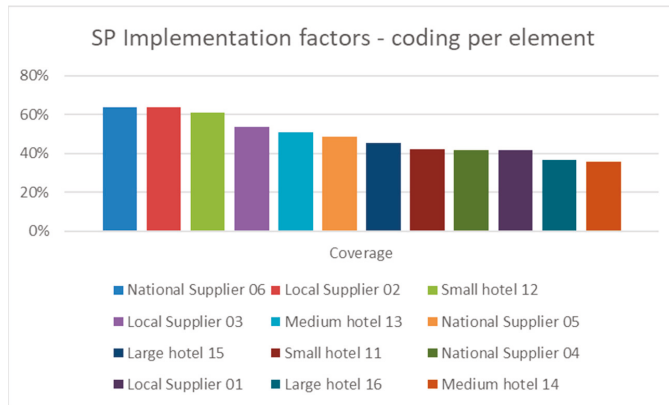


Figure 4. Relationship of categories with resources (interviews). Implementation factors—coding per element.

4. Results

In this section we present the findings or results of our research. The results are organized in two main subsections: (i) First, an evaluation of how companies in this sector follow the proposed models and frameworks from the literature; and (ii) second, findings on the identification of main drivers and barriers to effective implementation. It is important to mention that the semi-structured interview has been proven to be the best, if not the only, methodology to obtain the results that we present in this section. Some of the companies in this study do not have a website, and the ones with a website do not publish all information about sustainability practices. Their initiatives in SCM, and particularly SP, are not published and accessible. Surveys could have provided answers to some questions, but we considered that the depth, details, and nuances of the information that we were looking for could only be achieved through interviews with managers, experts in the hotel industry [87–90].

4.1. Evaluation of SP Practices

This section discusses the evaluation of the degree of implementation of SP in the supply chain of the hotel sector in Spain. It is done from the double perspectives of customers (hotel chains) and suppliers (industrial laundries).

In the literature review section, we identified different models for sustainability implementation in the purchasing function (see Table 1), and concluded that Leire and Mont's [25] model is the most complete and adequate, as it details all implementation stages. The findings from interviews confirm that the implementation of SP in the hotel industry follows this model, singularly five stages: (i) Developing internal policies; (ii) setting purchasing criteria; (iii) applying assurance practices; (iv) managing supplier relations; and (v) building internal capacity.

Interviewees also mentioned that this model could be completed by incorporating the following ideas:

- (i) An initial stage, before stage 1, with a strong commitment from the top management of the hotel companies.
- (ii) An internal review at the end of each stage, with the aim of verifying, confirming, and validating completion of the stage before moving forward in the implementation process.
- (iii) The supplier point of view, meaning that in some stages, feedback from suppliers should be considered as a check or validating point.

Once the model was validated, we proceeded to assess how the hotel companies had implemented it. The results that we obtained vary depending on the different types of hotel chains.

In large hotel chains, sustainability awareness and the commitment of the company's top management appear to be high, which is why they have developed initiatives internally. Once these initiatives were implemented within their organization, they were transferred to their suppliers. Large hotel chains have documented and formalized procurement processes, with a CPD at their headquarters. We account for initiatives in all five stages of Leire and Mont's [25] model, although some missing points were detected: (i) Not all initiatives proposed by that model have been launched; (ii) some initiatives have been launched but not completed or have not been effectively implemented; and (iii) there are initiatives launched in all five stages, but none of the stages have been fully completed.

Currently we can say that large hotel chains are in a phase close to maturity according to the model of Leire and Mont [25], that is, with initiatives in all stages.

Table 4 shows some quotes from interviews with large hotel chain managers on sustainability implementation in the purchasing function.

We obtained different findings for medium-sized hotel chains, depending on whether they have CPD or not. In general, all of them have defined purchasing procedures, although not completely documented and formalized.

In medium-sized hotel chains with CPD, sustainability awareness and the commitment of the company's top management are moderate. Internal policies on sustainability are vague, so they are vague when transferred to suppliers. We account for initiatives in some stages of Leire and Mont's [25] model (usually stages 1 and 2, none having been fully completed), and they are still far from carrying them to all stages. Some of these initiatives have been launched but not completed or have not been effectively implemented. Currently we can say that medium-sized hotel chains are in a phase close to introduction according to the model of Leire and Mont [25], that is, with initiatives only in one or two stages. Table 5 shows some quotes from interviews with medium-size hotel chain managers (with CPD) about sustainability implementation in the purchasing function.

Table 4. Quotes from interviewees: Large hotel chain managers.

<i>"The commitment to sustainability comes from top management here in Spain, who leads and promotes all the policies and activities carried out here, and this commitment reaches all employees. But, being a multinational company, all this comes to us from the headquarters, where it has been implemented for many years."</i>
<i>"The company owns a very well-defined code of conduct. Part of an implication of the top management of the company, with a very specific mission and values."</i>
<i>"These codes of conduct have been generated by our company in Spain, in the quality department, which is responsible for this, but they are based on the models that have been implemented internationally from the headquarters."</i>
<i>"Top management is totally involved. Every document, corporate memory, code of conduct is preceded by a total commitment by senior management."</i>
<i>"We have a very well-defined code of conduct. It starts with an implication of the top management of the company, with a very specific mission and values and the following sections: (a) Scope, application and compliance; (b) ethical and responsible behavior (general principles and commitment to stakeholders); (c) application procedure: advice and procedure to report complaints of the code of conduct; d) validity."</i>
<i>"There is a large department of corporate purchasing that leads these activities towards suppliers. In matters of sustainability, it works in coordination with the department of sustainability and the environment, to the extent that purchasing requests it."</i>
<i>"The code of conduct of the company has section with a code of conduct code of suppliers, to which they must adhere."</i>
<i>"Adhesion to the code of conduct. The code of conduct forms part of the approval contract of the purchasing department since 2012. It includes an acceptance clause as an exclusion criterion in the selection phase of suppliers. They need to be qualified to participate in the following phases of the contest. Last year, 173 codes were signed, reaching the cumulative figure of 1391."</i>
<i>"Purchasing management is responsible for the implementation."</i>
<i>"The signing of the code of conduct is done during the approval process. A supplier is not approved if it has not signed the code."</i>

Table 5. Quotes from interviewees: Medium-size hotel chain managers (with CPD).

<i>"The purchasing area is the leader for these initiatives."</i>
<i>"We do not include these clauses in contracts with suppliers."</i>
<i>"The purchasing tools and procedures are very professional. [...] The people who are part of the company have to become more professional and performant. These trends and practices come from a multinational environment."</i>
<i>"On a national level I think that sustainability in hotel industry is not done, or very little."</i>
<i>"It is an area for improvement that has started recently, but there is still a way to go, there are great potential."</i>
<i>"In our income statement there is a part that is energy, that repeatedly showed very high numbers. It was the reason to do an in-depth study."</i>
<i>"It works if it is a multinational or a large company. I suppose that multinationals put more weight on sustainability."</i>
<i>"The national companies I would say that they do not meet any 15 or 20% with the sustainability criteria. Why? Because they do not care."</i>
<i>"If we put weights, the truth is that the environment would be last. Yes, it is true that we are taking giant steps in this direction. But the price and the service are the key factors, and it cannot be otherwise in this moment of growth that we are having."</i>
<i>"The government should put more effort to ensure compliance with legislation and regulations to enhance these measures. In the same way the media can play a role in their favour, as an intermediate point between government and clients."</i>

Medium-sized hotel chains without CPD and small hotel chains present a similar approach to sustainability. In general, all of them have defined purchasing procedures, although not completely documented and formalized. None of them show any awareness or commitment from their top management to sustainability issues. The process of implementing some initiatives according to the model of Leire and Mont [25] has not begun within the companies themselves. Thus, if they do not believe in it and do not do it, they consider that they should not take any initiative on sustainability implementation with their suppliers. Tables 6 and 7 show some quotes from interviews with medium-size hotel chain managers (without CPD) and small hotel chain managers about sustainability implementation in the purchasing function.

Table 6. Quotes from interviewees: Medium-size hotel chain managers (without CPD).

<i>"Small and medium-sized companies have little interest in sustainability."</i>
<i>"Any hotel chain has significantly reduced the headcount, and apart from reducing the headcount, they have given more obligations to the remaining workers. Then, people do not have time."</i>
<i>"What is clear today is that companies look more at the economic part than at the sustainability one."</i>
<i>"The priority is cost reduction, without a doubt. It cannot be otherwise in the hotel sector in which we find ourselves and given the situation of general crisis and our exponential growth in these years."</i>
<i>"If this approach (to be certified in sustainability) arose here in a steering committee, the answer would probably be that there are other priorities."</i>
<i>"In the hotel sector the issue of certification is not as important."</i>
<i>"It is not the same to be a national company as an international one. The multinational companies are forced to follow internal regulations different from the national ones."</i>
<i>"This commitment requires in some way time, and time is money."</i>
<i>"I do not believe that today the client is properly educated on this issue of sustainability. Yes, it is true that there are people who are involved and committed, but on the total of society this percentage is still low. Maybe if they were, it could be a sales argument. But they are not yet."</i>
<i>"They do not do it because they surely do not have the requirement from their clients."</i>
<i>"In Spain I think that sustainability culture is not yet spread, and if in future it may be, I think that it will come from the outside. This is how I see this sustainability issue."</i>

Table 7. Quotes from interviewees: Small hotel chain managers.

<i>"I do not believe that society is aware, I honestly do not believe it."</i>
<i>"In the hotel management, we can say that sustainability is not a priority."</i>
<i>"First we have to make ourselves aware, I think."</i>
<i>"The large hotel chains might probably do more things in this sense, but the vast majority we do not it."</i>
<i>"I do not think that much is done about sustainability in the sector. At least it is not done in the hotels or in the hotel chains in which I have worked."</i>
<i>"And if it's not done in hotels like this, which is a 5-star hotel, less must be done in hotels with 1 to 3 stars."</i>
<i>"I do not deny that there are large hotel chains working on it. Now, I do not know to what extent they will really do it, that is, there may also be a big difference between what they show on the website and reality."</i>
<i>"I recognize that we are working on replacing luminaires with LED lamps. I admit that we are very sensitive to energy consumption, because of the costs."</i>
<i>"If at the same time that we reduce costs, less waste is generated, then it would be great. But the trigger I think is the cost."</i>
<i>"It takes time from my staff. And all this has a cost."</i>
<i>"At a business level, what counts is the revenue and the results. Results are the main goal, comply with the budget, obtain the expected profit. The rest is not as high priority."</i>
<i>"The shareholders, of course, are not aware. They only think about the results, the profit."</i>
<i>"If this crisis had never happened, the pressure for the result would surely be less intense, and I do not doubt that we would have evolved towards a more sustainable society. But now the criterion is the economic one."</i>
<i>"Sometimes the application of regulations is necessary to change things and raise awareness."</i>
<i>"We do not have support from the administration. There is a lack of resources, as information, containers for recycling, available and accessible disposal points, etc."</i>
<i>"Companies would surely implement sustainability if they felt more pressure from the administration."</i>
<i>"I do not think that customers demand sustainability at hotels. If they did, we would study the business case to analyze the profitability. I mean, if the number of customers grows significantly by being sustainable, then we would do it."</i>
<i>"Sustainability is not a priority for us. Which is the main reason? The lack of space, the costs and dedication times, that we do not have. I am convinced that sustainability is not a priority for the hotel industry."</i>
<i>"We do not have codes of conduct for sustainability. We do not have them internally, so we cannot ask the suppliers to comply with and sign them. I do not think that they exist in the hotel industry."</i>
<i>"It is not our responsibility as a customer to make sure that our suppliers comply with sustainability or legal issues. It is their responsibility, as well as the administration responsibility."</i>

4.2. Drivers and Barriers for an Effective SP Implementation

This research also identified the main factors that may influence the proper and effective implementation of sustainability in purchasing policies in the hotel sector. These factors could be drivers, facilitators, or catalysts insofar as they can help, facilitate, or promote these initiatives (positive approach). On the other hand, these same factors could also become barriers, obstacles, or limitations to the extent that they can hinder, slow, or prevent these initiatives (negative approach). For instance, the factor “commitment of the hotel chain management” could be:

- (i) A driver (positive approach): If the manager is committed, he/she will act as helper, facilitator, or promoter to support the implementation of these initiatives.
- (ii) A barrier (negative approach): If the manager is not committed, he/she will not support the implementation of these initiatives, becoming an obstacle, even stopping any related proposal.

A thorough analysis of all the interviews provides us with a list of factors, all previously identified in the literature (see Tables 2 and 3). Factors have been classified into three groups:

- (i) Internal factors (within hotel chains), relating solely to management and decisions within the scope of the chain.
- (ii) Internal factors (in the relationship between hotel chains and suppliers), relating to management and decisions around the relationship between hotel chains and suppliers.
- (iii) External factors (in the hospitality sector), relating to aspects of agents in the hospitality sector outside the relationship between hotel chains and their suppliers.

The most relevant factors are:

Internal factors (within hotel chains):

- Awareness and commitment of the hotel chain management.
- Economic or cost factor for the implementation of these practices.
- Risk reduction and brand image and trying to enhance visibility.

Internal factors (in the relationship between hotel chains and suppliers):

- Conflicts between hotel chains and suppliers on requirements to meet sustainability criteria and with a situation of increasingly lower prices and margins, or with operational criteria (product quality, service, delivery times).

External factors (in the hospitality sector):

- Demand: Final consumers who request compliance with sustainability.
- Requirements of regulations, governments, and public administrations.
- Market situation in terms of demand, prices, and margins.

Likewise, other factors were identified by the interviewees, but they were rated or considered as less important. They refer to issues related to facility or installation design, lack of space, the cultural and multinational nature of companies, lack of knowledge, and growth and expansion of the hotel chain. Some interviewees described these secondary factors more as excuses than real factors, as they thought the main issue was a lack of commitment from the hotel chain management.

5. Discussion and Conclusions

The objective of this research paper was to describe and evaluate the degree of implementation of SP in the supply chain of the hotel sector in Spain from the double perspectives of customers (hotel chains) and suppliers (industrial laundries).

As a first step, we evaluated how companies in this sector follow the proposed models and frameworks in the literature. In Table 1, we presented a summary of the main models and frameworks

from the literature. After a thorough analysis and as a result of our field work, we concluded that Leire and Mont's [25] model is the most adequate for SP implementation. We chose this model as a basis for our study because it has a clear focus on the practical implementation of sustainability purchasing in terms of (i) describing each stage and phase; (ii) identifying the responsibilities in these stages; (iii) identifying the factors that influence an adequate implementation; (iv) presenting a tool for decision making; and (v) being applicable to any sector. During the interviews, new ideas and proposals arose with the aim of completing this model. These proposals refer to incorporating new activities in the model; as: (i) An initial stage, about a strong commitment from the top management of the hotel companies; (ii) an internal verification and validation review at the end of each stage; and; (iii) feedback from suppliers as a check or validating point.

We detected a general lack of awareness of, or commitment to, incorporating sustainability within the purchasing function in SCM in the hotel sector. One reason could be that the study was carried out in the years after a big economical and financial crisis (2014–2019), so the economic factor is predominant in company decisions versus other aspects such as social or environmental.

Previous sections showed that we obtained different results depending of the type of hotel chain. Molina-Azorín et al. [53] proposed a classification of hotels based on a cluster analysis of how proactive/reactive they were about their environmental policies. This taxonomy cannot be strictly applicable to our study, as we consider a wider scope of analysis in two ways: (i) We analyze sustainability, which includes environmental, economic, and social aspects; and (ii) we study how it is implemented in the purchasing function, and not within the hotel company. Thus, a taxonomy of companies with different purchasing categories is proposed based on our findings in previous sections (see Table 8).

Table 8. Hotel chain classification related to the degree of implementation of SP.

Classification	Purchasing Processes	Model Stages	Hotel Chains
Advanced	Formalized	1, 2, 3, 4, 5	Large
Elementary	Defined	1, 2	Medium (with CPD)
Passive	Defined	None	Medium (without CPD) Small

“Advanced” refers to the group of large hotel chains with documented and formalized purchasing processes and implemented initiatives in SP at all five stages of Leire and Mont's [25] model, although we discussed that the implementation level is not complete in general.

“Elementary” refers to the group of medium hotel chains with defined purchasing processes and CPD. They have partially implemented initiatives in SP stages 1 and 2 of Leire and Mont's [25] model.

“Passive” refers to the group of medium hotel chains with defined purchasing processes and no CPD. They have not implemented any SP initiatives.

This research also identifies the main factors that may influence the proper and effective implementation of sustainability in purchasing policies in the hotel sector. These factors could act as drivers or barriers, and we grouped them into three types: (i) Internal factors (within hotel chains); internal factors (in the relationship between hotel chains and suppliers); and external factors (in the hospitality sector). Carefully analyzing these factors, we can conclude, on the one hand, that they are all part of what the literature identified (see Tables 2 and 3). Although the literature identified other factors, we must admit that our interlocutors did not consider them relevant. On the other hand, the literature exposes factors classified into two large groups, drivers and barriers; instead, our research allows us to conclude that the same factors that could act as drivers could also act as barriers depending on the way they are applied, as explained previously.

We can conclude that several of the factors refer to the potential conflict that could arise between the three aspects of sustainability (economic, environmental, and social) insofar as a hotel chain does not want to renounce consideration of the economic aspect in favour of the environmental and social

aspects. This can be seen in the factors that deal with costs and investments, prices and margins, quality and service. Another group of factors is related to the commitment to, and awareness of, sustainability, both by the management of hotel chains (whose initiative and leadership are necessary for the implementation of these practices), and by governments, customers, and markets, which, each in its scope, may motivate companies and require them to comply with sustainability criteria themselves and in their purchase from suppliers.

This paper is of practical and social interest, and offers managerial implications, as the results of this study provide meaningful guidelines for different stakeholders (users, customers, suppliers, society, governments, employees, etc.). From a practical point view, we would like to propose some recommendations and initiatives in the direction of supporting the drivers or factors for effective implementation of SP in the hotel industry.

First, we suggest continuing to promote consciousness and commitment from society in general, and hotel guests and customers, in particular. This could be achieved with communication and awareness programs by governments, entities, agencies, or media. Lessons learned from more developed countries could be brought to this topic. When individual customers are committed, they will demand it from hotel chains. Corporate and group customers commitment towards sustainability is also very important, and as they manage high volumes in terms of sales for the hotel chains, they can exert higher power to them oriented towards demanding the implementation of sustainable practices within the hotels and SP practices towards their suppliers.

Second, the implication of the government must also be manifested in other directions, such as: (i) Launching initiatives with the aim of standardizing, simplifying, and clarifying the different regulations that concern aspects of sustainability; (ii) putting in place mechanisms of pressure to ensure that these regulations and laws are respected; and (iii) providing support and resources for hotel chains (such as glass hoods, containers, delivery points, and nearby waste collection).

Third, support should be provided to raise the consciousness of, and commitment by, hotel chain management. The above-mentioned recommendations could help, in the same way that other results from this paper could help them understand that sustainability practices in SCM are a means to achieve competitive advantage rather than a cost conflict issue. Redesigning processes and contract relations in SCM should be a strategic decision.

This research is bound by certain limitations, as are many other studies. First, we limited our interviews to 15, which was enough for our research purposes, but could be extended in future research, and even supported by a survey. This could reach a wider population and different management profiles that could help researchers obtain more data and information, and richer results with the aim of evaluating the applicability of the proposed SP model. This could also be done by different typologies of hotels (for instance, rural, holidays, city hotels), and tests of the applicability of the proposed SP model could be carried out in each of these typologies.

Second, we limited our study to a very specific geographical area (Spain) and period (2014–2019). By extending the research to other geographical areas researchers could have the opportunity to assess how SP is implemented in the hospitality industry in different societies with different levels of consciousness compared to Spanish society. It would also be a good opportunity to evaluate the applicability of the proposed SP model.

Third, we focused on one specific type of supplier, industrial laundries, with a clear impact in the three dimensions of sustainability, but this could restrict the applicability of results. Therefore, research could be extended to other suppliers (for instance, room cleaning companies, maintenance companies, etc.) with different operational contexts and constraints. For instance, room cleaning companies are also labour intensive and deal with environmental issues (use of chemical products) but in a different manner than industrial laundries (less water and energy consumption, as an example).

Fourth, research could also be extended to other members within the supply chain (for instance, tier 2 or tier 3 suppliers). It could be interesting to assess how SP practices are implemented in tier

2 and tier 3 suppliers, evaluating the different roles of the hotel chains and the tier 1 suppliers, and testing the applicability of the proposed SP model.

Fifth, we consider that the lack of certified or labelled hotels in our analysis may be a limitation. It would also be interesting to carry out a comparative analysis of certified or labelled hotels versus non-certified hotels with the aim of evaluating sustainability policies, how they have been implemented towards their suppliers, as well as the applicability of the SP model in both contexts.

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Appendix A

Interview Script Summary

The interview script consists on more than 50 questions and sub-questions based on literature review. It has been summarized to present the main topics.

Introduction

Research Project introduction.

Questions related to Sustainability definitions, individual and business approaches.

Questions related to sustainability applications within the interviewed company, as well as about the real consciousness of the corporation.

The Development of Internal Policies on Sustainability

Internal policies on sustainability (social, environmental) within the organization: codes of conduct, guidelines for the proper use of resources, waste management, social issues, etc.

Questions related to the training and sensitization of personnel: number and type of initiatives, trainers, etc.

Purchasing Codes of Conduct

Purchasing codes of conduct elaboration. Who? How? Responsibilities, documents, objectives, qualitative/quantitative, management commitment.

Purchasing codes of conduct implementation. Who? Responsibilities. How? Communication to suppliers, documents.

Definition of purchasing criteria (social, environmental, economic). Contracts. Same criteria for all suppliers?

Application of Control Practices for Suppliers

Practices to monitor supplier performance (operational, quality, service, social, environmental).

Auditing to suppliers. Who? How? Responsibilities, documents, goals, key performance indicators (qualitative/quantitative), own procedures and methodologies or standard, etc.

Same criteria/format for all suppliers?

Ranking for evaluation of suppliers.

Internal/external auditors.

Management of Relationship with Suppliers

Supplier selection criteria. Prioritize.

Who? How? Responsibilities, documents, procedures.

Environmental and social indicators?

Lack of compliance/Contingency plans/Continuous improvement plans.

Team work and collaboration versus top-down relationship.

Sustainability Internal Capacity Development
Best practices in sustainability as an individual responsibility for the supplier versus as a joint responsibility.

Formal plans to expand sustainability practices in future (more suppliers, more codes of conduct, better performance, training, best practices sharing, etc.).

Capabilities: Who? How? Responsibilities, documents, procedures, tools, external support.

Integration with business management.

Drivers and Barriers for an Effective Implementation of Sustainable Purchasing

Drivers/enablers identification. Justification.

Barriers identification. Justification.

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Article

Semantic Icons: A Sentiment Analysis as a Contribution to Sustainable Tourism

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Abstract: The construction of this research was developed to reflect the way information and communication technologies (ICT) have transformed the tourist distribution channel. This phenomenon has caused, in the first place, the direct interaction between tourists and tourism operators and, second, the appearance of real virtual intermediation actors, a situation that disadvantages the activity of traditional travel agencies and causes immersions in reintermediation processes at risk of compromising its permanence in the market. On the other hand, in a sustainable tourism context, this work represents an opportunity for intermediation agencies in terms of a value management practice as they can develop sustainable promotion processes that promote, for example, the protection of the territory, the conservation of resources, and cultural rescue. Therefore, according to travel agencies, to directly influence the distribution chain, we verified this work to demonstrate the use of digital language as a benefit in the design of sustainable tourism products. Thus, from the methodological discipline of discourse analysis, we created sets of words with semantic content that were valued through the sentiment scales of the Facebook social media network. The results showed that digital promotion favors airline companies and hostels more than a sustainable tourism environment as such. Finally, from the study of probability and density equations, predictive models were used to configure linguistic icons in promoting sustainable tourism.

Keywords: semantic analysis; ICT; essential marketing; tourism and sustainability; value and tourism

1. Introduction

The gradual growth of tourism can be represented by an annual average of 4% during the last eight years, which represents a displacement of over 393 million people [1], indicating an opportunity for impulsive tourist activities. It can also favor the progress of countries as it also provides positive impacts to their economy. However, it can also present negative repercussions regarding the protection of the environment due to the development and abrasion of their resources [2,3]. This issue, seen from the perspective of sustainable tourism, must be managed together with the generation of employment and wealth; the conservation of culture and patrimony, social inclusion, and respect to diversity; the efficiency of resources; and the fight against poverty [4].

A great number of researchers have addressed these problems by motivating and proposing the promotion of tourist destinations by distinguishing different aspects. For example, the synergy between faith and religion as a cultural essence for the delineation of strategies [5–7]; the awareness of animal protection that regards them as elements that improve tourism and the economic potential of a place [8–11]; the handcrafting and agricultural impulse [12,13], along with ancestral practices [14,15] as a revitalizing economic alternative in rural areas; the development of gastronomy entrepreneurship as culture value; and the fight against poverty [16,17].

However, according to an ontological dimension, a tourist destination has to be studied beyond these aspects, and even include psychological and emotional factors due to the fact that sustainable tourism is seen as the result of development, is understood as a response of the actors' needs—travelers and the local community—and their long term projection capacity [18]. All these factors are a necessity for the adoption of marketing strategies [19]. Furthermore, this approach can be consolidated with an approximation of evaluation through economic, environmental, socio-cultural, institutional, and infrastructure indicators [20–22]. Although, according to all stakeholders, there exist some other factors that must be analyzed, but have been minimized, such as the phenomenon of 'overtourism', where some democratic terms need to be integrated into the rights of people [23].

In this research, we describe the theoretical bases and orientations of interest as we try to create a model of social responsibility. Besides, we examine the necessity of generating a conscience in travelers toward respect for the territory, as intermediation agencies are responsible for the promotion of activities both inside and outside its boundaries [24]. Additionally, in the value chain model, the distribution of tourist offerings constitutes a facilitator between tourism operators and tourists, and becomes an important link to spread, drive, and ensure the sustainability of tourist destinations [25]. Furthermore, it has met with resilient arguments to face de-intermediation in the development of social responsibility [26].

The aims are to sustain the structure of tourism intermediation [27] and adapt to the transformations produced by the interference of information and communication technologies (ICT), that some researchers [28,29] have addressed, such as:

1. The increase of the operators and their capacity to establish a vertical and direct relationship with the tourist, thus avoiding intermediation;
2. The necessity of personalization processes undertaken by the intermediaries, thus recovering power and position in the channel;
3. The effectiveness of the construction of products that respond to the tourists' needs; and
4. A transformation in the activity of the final consumer, who demands the implementation of co-creation processes.

Additionally, to maintain sustainability, an evaluation must be made for corporative management to ensure satisfaction among all the interested parties, resource management [30], the reduction of the process, and the integration of the micro, small, and medium businesses to the quality objectives [31] such as quality of service, cost reduction, consistency, and information security.

Thus, to exploit the use of ICT, and give value to the management of tourism intermediation, this research was constructed as a follow-up study of previous work. This defined a technological ecosystem, where the models of business-to-business and business-to-consumers would work on a dynamic of intelligence and internal management based on interaction and knowledge [31]. The intention is that, from an innovation attempt, a logical sequential flow of identification, capture, creation, and diffusion of knowledge that contemplates touristic horizons regarding accessibility, accommodation, attractions, and services is adapted [32]. In addition, instituting it simultaneously as a tool for the value chain to facilitate the management and integration of the actors [33].

It must also be extended not only as a simple solution of optimization but as a contribution to gathering relevant information for decision-making and the definition of strategies. For instance, the information regarding the determination of content associated with travelers and their relationship with the existing attractions within the touristic space [34]. Thus, the aim is to try not to reach a critical status where the traveler wastes their traveling experience by seeing themselves embedded by the excessive use of technology, obtaining, in this way, a false perception and satisfaction, and causing isolation of the individual or becoming a case of e-lienation [35] due to loss of authenticity [36–38] and the intra-personal authenticity destroyed by the technophilia [39].

As a practice of social manifestation, consequences are spread through social networks, becoming significant input for marketing studies and merchandising planning, and should be managed through

the adoption of technology [40]. In this research, social and environmental variables were an important alternative contribution within the 'triple bottom line' (Guidance framework for measuring business objectives that considers economic, environmental and social aspects [41]) [42]. In this way, sustainability is not only provided by the business, but also accomplishes different precepts of the administration and preservation of resources for future generations, attending to the need for sustainability for the development of society [42].

Hence, the actions that the business must perform through social networks must consider an implicit benefit for the travelers; in addition, the interaction and immediacy of response can be formalized as they are features that affect the brand attitude and corporate confidence [43]. Furthermore, they are configured in hedonist forms for tourists and associated to use the channel and income for the business [44]. In addition, they indicate that in the context of tourism, a large volume of information prevails that is dependent on effective communication [45]. In this research, acculturation manifestations are represented [46] as derived from the social impact exteriorized through stress factors, adaptation processes, and negative emotions [47,48] as well as integration and polarization facilitators, which transform the society and create new consumption opportunities [49].

Therefore, to discover and understand the meaning of the digital social expressions that go beyond simple words, this research is attached to the horizon of discourse analysis (DA), as the comprehension of the social dictions of natural language and their meanings are promoters of a real construction of the society [50,51]. Moreover, as described in [52], it helps to establish a logical inferential structure for accessing knowledge as a contribution to Aristotle's logic, so that language analysis explains the nature of the environment and facilitates the detection of requirements [53]. Arguments of special interest for this work try to offer an opportunity of applied investigation and practical contribution to innovation in intermediary tourism agencies.

Likewise, the importance of lexicon and discourse, according to [54], favors facing the control that it exercises on any society, as demonstrated in the investigation conducted in [55]. This fact was intended to be transformed with this investigation, ensuring that control favors intermediary agencies as a conciliating entity between supply and demand. It is then important to delve into the semantics to discover the relationships that, from the inspection of the 'corpus', facilitate the configuration of new statements of values adapted to a reality [56], that are elaborated and guided by cognitive structures [57] that define the linguistic signs as the representation of a tourist's object of interest. Therefore, to benefit the results in this research, and according to [58], which acknowledges the contribution of DA to the analysis of conflicts in economic, political, anthropological, and psychological environments, it is expected to be the pragmatic basis of a new approach into the paradigm of sustainable tourism.

Additionally, it is important to discover if digital social expressions represent, in some measure, the desires, beliefs, and values of a society and the tourist environment. They must respond, from a cognitive line to an enforceable action from prior planning that understands that the textual and contextual structure allows for the formulation of the message in the receptor, giving them a fast and convenient meaning [59]. However, their subjectivity must be registered in the subjectivity of the social context—understood as the tourist environment in this study—and discourse [60]. All of this is to recognize the 'systems of dispositions', which are latent in the environment and the social structure [61], so that it can reaffirm itself and cause a transformation, benefiting sustainable development if it is necessary.

However, why is it important to analyze the text in tourist publications? Because answers are given, mainly the ones regarding the studied theories by [62], who highlighted that: (a) Language is constituted as a graphic system that expresses the social behavior and its knowledge as semiology [63]; (b) through linguistic registers, the variations of expression are evidenced, so prediction is manifested; and (c) semantics contain the meanings of social context. For this reason, and in agreement with [64], these signs represent the relationship or influence of an object—that is expected to be the tourist environment—and an interpreter, who is a traveler or tourist. However, as suggested by [65],

they naturally express physical phenomena, for example, a sunset or a dance, or unconscious human behaviors that, by the way, will serve to make sense of something that is not consciously conceived [66].

Finally, this research will serve to help tourism intermediaries manage sustainable development. Although it acknowledges the contributions that can be obtained through marketing practices, it is not oriented to the centralization of common management that considers the necessities of the visitors versus the products/services to motivate purchasing and consumption processes per se [67,68]. Nor does it express an analysis of the environment, and through the harnessing of power, the public relations and alliances with suppliers [69], but strives to reach sustainable development such as the one underpinned in the essential marketing paradigm that interprets the behavior and meanings associated with codes and social archetypes. This is so that a perceptual concept can be constituted by the physical concept and the imaginary concept, which comprehends cultural diversity, ethnic groups, geography, and socio-economy [70] to such an extent that symbolic goods, whose commercial value develops an understanding of their cultural values, can be defined [71].

In summary, because social networks are a communication trend and interaction with them promotes social transformation, the purpose of this research was to understand the reality that travel agencies must provide to improve the sustainable development of tourism. This requires the promotion of tourist destinations as a contribution to the value chain. Moreover, due to symbolic interactionism, where individual behavior is outlined over the meaning of things [72], it might be significant to promote a proposal that can sensitize the tourist toward an emotional connection with the territory and the country that they visit.

Thus, after the application of discourse analysis techniques, semantic analysis, and the analysis of emotions, this work tried to prove if the travel agencies promoted sustainable development practices, which, from their meaning, were of interest to the tourists. However, even if this research could identify linguistic icons associated with the tourist context, they would be constituted as a commercialized success of the offer, especially for airlines and accommodation providers. This finding motivates the continuation of further investigation that reviews the reality of the benefits of a sustainable environment.

2. Fundamental Theories of Research and Sustainable Tourism

This section supports theories that connect by shaping an approach toward sustainable tourism from the management of intermediation in the exploitation of digital content. In this sense, first, it is emphasized that thanks to the incursion of ICT, the traditional model of tourist intermediation has been transformed since agencies and operators have witnessed the arrival of specialist distribution agents through digital channels [29]. In addition, operators have found opportunities for direct negotiation with travelers, dispensing with the services of intermediaries. This reality has forced intermediaries to outline strategies to strengthen and compete in a way that favors their permanent place in the market [73,74].

Therefore, by trying to facilitate new management models through digital technological adaptation, the research adheres to the value theory as it allows for the design, definition, and delivery of products as an intention of competitiveness [75] and differentiation, that is also conceived in a generation of awareness for the protection of the territory [24,25]. However, it must also contribute to the intelligent integration of the actors in the distribution chain, which involves the generation and exchange of information and knowledge [26,27,33,76]. In addition, it should help improve the tourist experience as an essential activity [77] by also encouraging the protection of resources, the rescue of culture, and sources of employment [2–17].

Therefore, if virtual channels are considered as the scenario in which the intermediation action takes place, it is appropriate to assume that the digital content should act as an input entity for the behavior analysis, as the information delivery of a sustainable message that, once again, improves travel practice and promotes the development of the tourist destination.

Consequently, this purpose was carried out through the practice of discourse analysis. This is mainly because digital channels, and mainly virtual social networks, encourage the exchange of

information that demonstrates the behavior and expression of society. Manifestations through which it was sought to establish the basis for intelligence processes that, thanks to the theory of sets, could denote relationships between axiomatic elements [78] consisting of linguistic components and an assessment understood from the analysis of feelings.

Derivations that can ultimately be inferred in concept from the paradigm approach of digital marketing, while provoking a practice in such a way that the negotiator can build a sufficiently striking message, are products of the co-creation of knowledge [44,49]. It not only seeks to only close a sale, but to offer something that causes a truly pleasant feeling in the consumer as a new cultural reality by highlighting the characteristics of the object [70,71] that, in this case, are semantically constituted in the cultural, natural, and social properties and values of the tourist environment [50–53,59–66].

3. Materials and Methods

3.1. Discursive Methodological Configuration

The discursive analysis of the text in this research was laid out through a scheme suggested by [79] that is illustrated in Figure 1. It represents sustainable tourism as a conceptual concept supported by the essential marketing and value theory as key concepts for development. Furthermore, for the application of the method, discourse analysis is the main discipline in an approach to social semiotics. Finally, the own structures of the language will be analyzed in distinct to the components of the grammatical phrases.

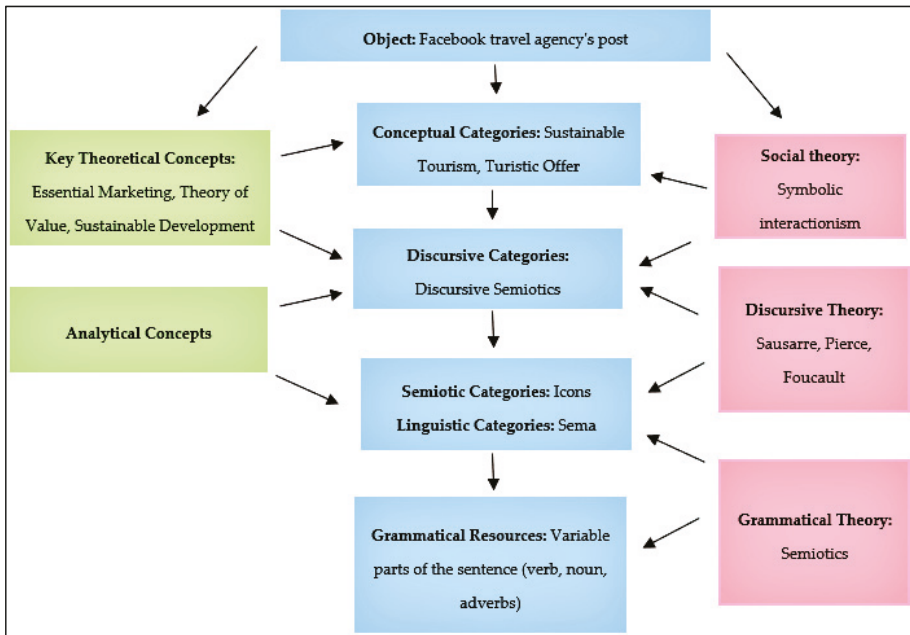


Figure 1. Discursive methodological configuration.

3.2. Discursive Analysis

The logic of discursive analysis was directed through procedures supported by the computing linguistics of (1) the object of study, for example, posts by Facebook travel agencies, as input data; (2) the morphology, semantics, and pragmatic knowledge as actions of the computing processing; and

(3) the predictive icons of the language as output text. This process was adapted from [80] with the following phases:

A computing morphological analysis that:

- Automatically extracts posts made by travel agencies on Facebook. To do this, NCapture was used, which is a web browser extension of the Nvivo software. From here, the universe of the words to be studied was created.
- From the universe, words were classified by language, numeric characters, hashtags, and another called 'trash' that corresponded to those that did not provide semantic information such as symbols and email addresses as well as those with a length of one character as they did not represent semantic content.
- Produced a second classification that distinguished customer names, street names, prices expressed in letters, web addresses, and words like 'cell', 'cel', or 'tel' as they only refer to telephone information provided for contact, and consequently, they do not affect the semantic content.
- Spelling mistakes were corrected, mainly the ones regarding the use of tildes (e.g. the word 'acomodacion' (accommodation) was changed to 'acomodación'. Additionally, some compound words were identified and unified (e.g., the words 'Abu' and 'Dabi', which appeared separated were put together, resulting in 'Abu Dabi').
- A group of words that were called 'irrelevant' was recognized. Here, the grammatical prepositions (e.g., 'por' (by), 'para' [for], 'entre' (between)), articles, and conjunctions (e.g., 'pero' (but), 'porque' (because)) were included.
- Concluded with the conformation of elemental grammatical units through the free online lemmatizer developed by the Group of Data Structures and Computing Linguistics of the University of Las Palmas (<http://www.gedlc.ulpgc.es/investigacion/scogeme02/lematiza.htm>).

A semantic analysis that from the posts:

- Coded the meaning of the words, without distinction of the association of the tourist context, through the Nvivo software. Here, the nouns, adjectives, verbs, and adverbs were identified. Thus, what this research intended to do was to represent the tangible elements associated with the perception of the senses with nouns, quality of the feelings toward the nouns with adjectives, the exercise of action with verbs, and the conditions and circumstances linked with the ones above-mentioned with adverbs.
- Conducted a morphosyntactic analysis of these words, according to the different contexts of a sentence in the case of homonymy and polysemy through the Stilus (<https://www.mystilus.com>) software.

A pragmatic analysis that:

- Related the semantic content of the tourist environment through the associations of nodes as shown in Figure 2.
- This analysis used the Chi-Square (χ^2) statistical test with a significance level of $\alpha = 0.05$, where the hypothesis to be tested was the association between the grammatical categories and the nodes of the tourist context if the p-value was superior to the critical value.

An analysis of feelings was made to validate the lexicon of touristic words in order to undertake a simulation on how much these words could be attractive to tourists, understanding that, according to [60], an expression of feeling coming from an individual impulses or impacts on the feelings of a collectivity; therefore, it is important to identify the positive words in different posts with the purpose of provoking positive semantic impacts. To accomplish that expressed above:

- Within the facilities of a travel agency, clients were observed who requested information motivated by undertaking an intention to travel. Of these, 20 volunteers of legal age, regardless of gender,

purchasing power, or interest in tourism products, digitally evaluated the words of the lexicon. To do this, they used the sentiment scale that Facebook configures to assess the publications and resembles a 6-point Likert scale [81,82]. For instance, 1 = Angry 😡 ; 2 = Sad 😞 ; 3 = Amazed 😲 ; 4 = Like 👍 ; 5 = I enjoy 😊 ; and 6 = I love ❤️ .

- To achieve a level of concordance, Kendall’s W statistical test (Equation (1)) was applied and calculated using Statistical Package for the Social Science (SPSS) software for a value of W acceptance close to 1.

$$W = \frac{12 \sum_{i=1}^k S_i^2 - 3n^2K(K + 1)^2}{n^2K^2(K - 1)} \tag{1}$$

where *K* is the number of characteristics subjected to evaluation; *N* is the number of elements of study; and *S* is the addition of the marks obtained in each of the evaluated characteristics.

- The calculation algorithm found the best combination of judges for an acceptable value minimum of $\alpha = 0.7$. The results were obtained by calculating the highest value between combinations from 2,3,4,5... *n* evaluators.

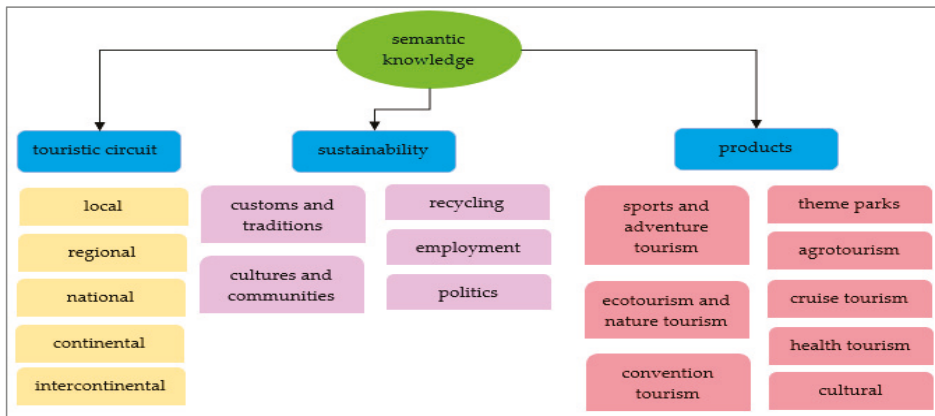


Figure 2. Pragmatic knowledge representation. Adapted from PLANDETUR 2020 (Design of the Strategic Development Plan of Sustainable Tourism for Ecuador. <https://www.turismo.gob.ec/wp-content/uploads/downloads/2013/02/PLANDETUR-2020.pdf>).

3.3. Predictive Analysis

As a complement oriented to analysis intelligence, this research intended to discover the linguistic icons from the lexicon. This, according to [83], defines the horizon of the marketing expansion by means of placing each word into different ranks that follow the vital cycle of marketing via the knowledge of (a) the novelty, (b) the trend, (c) the new fashion, (d) the top, (e) the consolidation, and (f) the obsolescence. To do this, the probability thresholds considered are shown in Table 1.

In this sense, the normality of the frequencies was first studied through the Kolmogorov–Smirnov (K–S) test, with a significance level $\alpha = 0.05$. In this way, if the p-value obtained for the categories was higher than the significance level, the normality of the distribution would be accepted. Subsequently, the function of the density and the definite integral (Equation (2)) was undertaken with the study of the goodness-of-fit applied through the coefficient of determination R^2 to represent the behavior of the linguistic expressions and test the forecast model of each word set.

$$P_w (a \leq X \leq b) = \int_a^b f(x)d(x) = F(b) - F(a) \tag{2}$$

where P_w is the probability of the word; a is the lower limit of the area (1 for all cases); and b is the upper limit of the area, which is the frequency value of the word.

Therefore, from the density function, by integrating the lower limits of 1 and upper limit equal to the frequency value of the word, the space in which each word would be located according to the horizon of market expansion could be determined later. The purpose for which, through Chebyshev's Theorem (Equation (3)) to find the probability of occurrence of an event for any random variable X as a function of k standard deviations concerning the arithmetic mean μ , is detailed in [84].

$$P(u - k\sigma < X < u + k\sigma) \geq 1 - \frac{1}{k^2} \quad (3)$$

where K is the to the threshold of distribution of the area under the curve meeting $-3 \leq k \leq 3$; μ is the arithmetic mean; σ is the standard deviation; and X is the random variable word such $X \in S$.

Table 1. The threshold of probability for marketing expansion.

Status	Area From	Area Up
The novelty	-3k	-2k
The trend	-2k	-1k
The new fashion	-1k	μ
The top	μ	1k
The consolidation	1k	2k
The obsolescence	2k	3k

3.4. Study Case

To carry out the study and application of the methodology, the city of Cuenca in Ecuador ($2^{\circ}53'51''$ S, $79^{\circ}00'16''$ W) was taken as a study case, with the purpose of contributing to the improvement of tourist activities in a city listed as a Cultural Heritage of the World site, thanks to its architectural, archeological, and natural potential. This city has received a World Travel Award in 2017 as the lead travel destination for short holidays in South America. In addition, the consolidation of the city as a sustainable destination is sought.

Conversely, reasons to use intermediation have responded to the fact that during the last three years, according to what has been observed by the author in the given inventory by the Ministry of Tourism of Ecuador, the travel agencies, operators, and wholesalers have registered an increase regarding the cessation of business, a fact that is affecting the economic development of the city. For this reason, it is expected that the results obtained in this research could provide development pathways through the practice of smart technological alternatives. Likewise, according to previous diagnostic studies, it is evident that businesses in this area are not strong about their digital practices for the promotion of their different offers due to:

1. The quality of their websites, which are deficient, as seen from the promotional content and their functionality [85].
2. The lack of estimates regarding basic management oriented to optimization practices in different search engines [86].
3. A lack of knowledge about the administration of social networks [31].
4. An average e-readiness of three on a scale of 1 to 5. This fact confirms the above-mentioned, aside from the lack of interest in the starting processes oriented to the adoption of smart digital technologies [31,87].

From this reality and in concordance with the inventory of tourism intermediation businesses in 2018, 151 travel agencies were recognized. However, of the 86 travel agencies who undertook activities on Facebook, only 49 had an official fan page, which limited the automatic extraction process with NCapture, and 22 demonstrated the constant activity with a minimum of 100 monthly posts.

The number of entities was finally used for the analysis of their posts over a period between 1 January and 31 December 2018. During this period, travel agency administrators made 6057 posts, thus forming a total universe from which, with the Analysis Stats 2.0 software, a finite-sample was applied with a 95% confidence level and a margin of error of 1%. Finally, we determined a sample size of 3714 posts (D).

Thus, finally the sampling was conducted at convenience and only studied the companies with a total number of posts that exceeded 100 monthly, because at the discretion of the digital marketing experts [88,89], a frequency between two and five daily posts causes interactivity between the client and the company and substantially improves the return on investment. This added 5412 advertising discourses (X), which was 1968 more than the sample size, and corresponded to 22 businesses. Subsequently, to establish the percentage of the proportion of 69% between D and X, the number of posts to study for the business was determined, as shown in Table 2.

Table 2. Sampling of posts.

Enterprise	Posts (Q)	Post by a Company (69%)
E1	589	404
E2	340	233
E3	110	75
E 4	125	86
E 5	329	226
E 6	219	150
E 7	384	264
E 8	259	178
E 9	127	87
E 10	149	102
E 11	157	108
E 12	288	198
E 13	125	86
E 14	254	174
E 15	245	168
E 16	111	76
E 17	281	193
E 18	117	80
E 19	163	112
E 20	109	75
E 21	677	465
E 22	254	174

4. Results

After applying the methodology, the obtained results were as described below. These are mainly represented through the set theory to facilitate understanding.

4.1. Morphological Analysis

Some base sets were constructed for the classification of terms and to facilitate the morphological analysis, the results of which are presented in Figure 3, with some samples of the content of these sets shown in Figure 4.

Set U = {all the terms included in the posts}

Set S = {Spanish language words}

Set E = {English language words}

Set I = {Italian language words}

Set F = {French language words}

Set A = {Austrian language words}

Set N = {numeric characters chain}

Set H = {hashtags}

Set T = {trash terms}

Set X = {length 1-character terms}

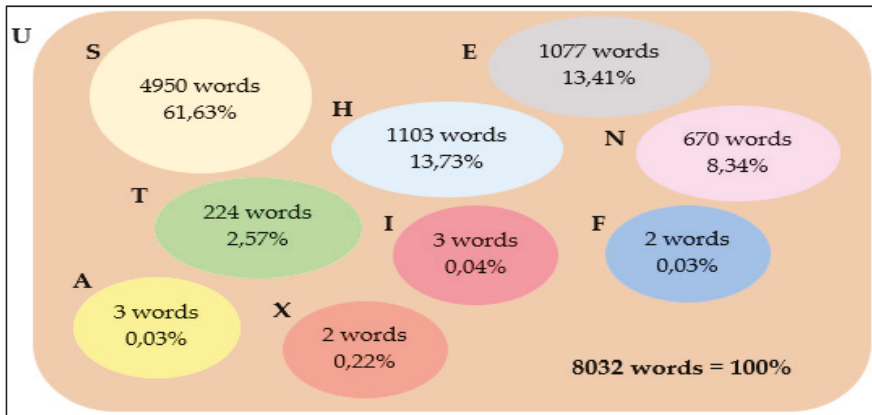


Figure 3. Word sets.

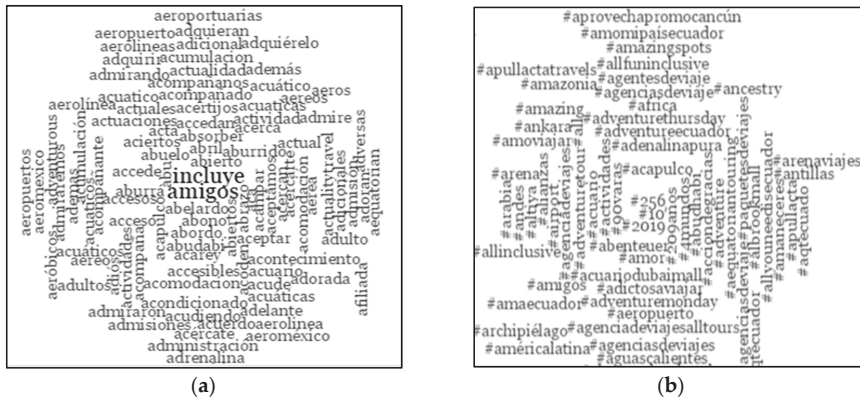


Figure 4. Subsets samples. Panel (a) shows the Spanish word set (S), and panel (b) shows the trash word set (T).

From the obtained data, the study focused on the Spanish word set because the setting of this research mainly expressed the information in this language and because the size of the information was mainly in Spanish. Therefore, from the Spanish set (S), new subsets were configured as shown in the following.

S' = (words that represent names of customers, names of streets, web addresses, and prices)

Some examples of words included in this set were: 'www. Teléfonos, Gabriel' (proper name referred to a customer and no to a character associated with the environment), 'Córdova' (derived from Presidente Córdova street).

S'' = (words with corrected spelling mistakes)

Examples of this set were the words: Iguazu (it should be Iguazú), 'gastronomico' (it should be 'gastronómico').

R = (articles, prepositions, and grammatical conjunctions).

S₂ = {independent words that form compounds of two words}

Examples of words included in this set are the words ‘Abu’ and ‘Dabi’, which appeared independently when the real word is ‘Abu Dabi’.

S_3 = {independent words that would form a compound of three words}

Examples of words included in this set are the independent terms ‘Amari’, ‘Havodda’, and the ‘Maldives’ that would form the compound word ‘Amari Havodda Maldives’, and refers to a proper name of a place of accommodation.

S_4 = {independent words that would form a compound of four words}

Examples of words included in this set are the independent words ‘Barceló’, ‘Maya’, ‘Grande’, and ‘Salinas’, that would form the compound word ‘Barceló Maya Grande Salinas’, which also refers to a proper noun of a place of accommodation.

S_5 = {independent words that would form compound terms of five words}

Some examples of this set are the independent words ‘Museo’, ‘de’, ‘Cera’, ‘Madame’, ‘Tussauds’ that would form the word phrase ‘Museo de Cera Madame Tussauds’, which refers to an attraction in the United Kingdom.

S_6 = {Independent words that would form phrases of six terms}

Examples of words that were found in this set include ‘Holiday’, ‘Inn’, ‘Express’, ‘Miami’, ‘Doral’, ‘Airport’. Written together, they make the phrase ‘Holiday Inn Express Miami Doral Airport’, which is also a place of accommodation.

S_7 = {irrelevant words}

S_{2a} = {compound words of two terms}

S_{3a} = {compound words of three terms}

S_{4a} = {compound words of four terms}

S_{5a} = {compound phrases of five terms}

S_{6a} = {compound phrases of six terms}

To count the number of words and obtain the total of terms for the subsets (S_{2a}), (S_{3a}), (S_{4a}), (S_{5a}), and (S_{6a}), Microsoft Excel was used as shown in Equation (4). In this way, the final presentation of the (S) set and its subsets can be illustrated in Figure 5:

$$= \text{IF}(\text{LEN}(\text{TRIM}(\text{range_cell})) = 0; 0; \text{LEN}(\text{TRIM}(\text{range_cell})) - \text{LEN}(\text{SUSTITUIR}(\text{range_cell}; ""; ""))) + 1 \tag{4}$$

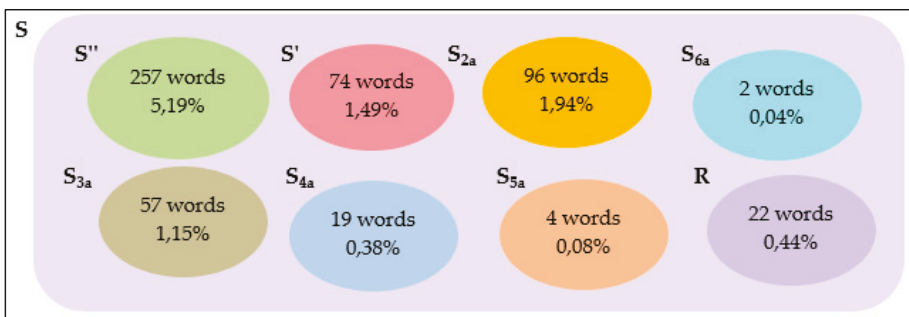


Figure 5. Spanish word subset distribution.

Thus, by operating the (S) set and all its subsets through Equation (5), the relative set (W) was built. Here, the lemmatization process was applied after identifying the canonical or lexeme forms, consolidating the last set, named Lexicon, with 1999 validated terms for the semantic content.

$$W = (S \setminus S' \setminus S'' \setminus S_{2a} \setminus S_{3a} \setminus S_{4a} \setminus S_{5a} \setminus S_{6a} \setminus R) \cup S_{2a} \cup S_{3a} \cup S_{4a} \cup S_{5a} \cup S_{6a} \tag{5}$$

4.2. Semantic Analysis

In the Nvivo program, the words of the lexicon were coded according to four grammatical categories, whose distribution is shown in Table 3.

Table 3. Semantic grammatical distribution.

Set	Number of Words	Percentage of the Lexicon
Adjectives	296	15%
Adverbs	39	2%
Nouns	1396	70%
Verbs	268	13%

Additionally, the Stilus program was simultaneously used to avoid grammatical disambiguation and identify cases of polysemy and homonymy, as shown in Figure 6. The result would permit, not only the representation of a grammatical category but also the establishment of an adequate sense of the relationship with the other components of the sentence. Therefore, for instance, a term could be classified as an adjective, noun, or any verb form; however, when discovering their relationship in the ‘corpus’ of the sentence, it would be convenient to code it as a noun.

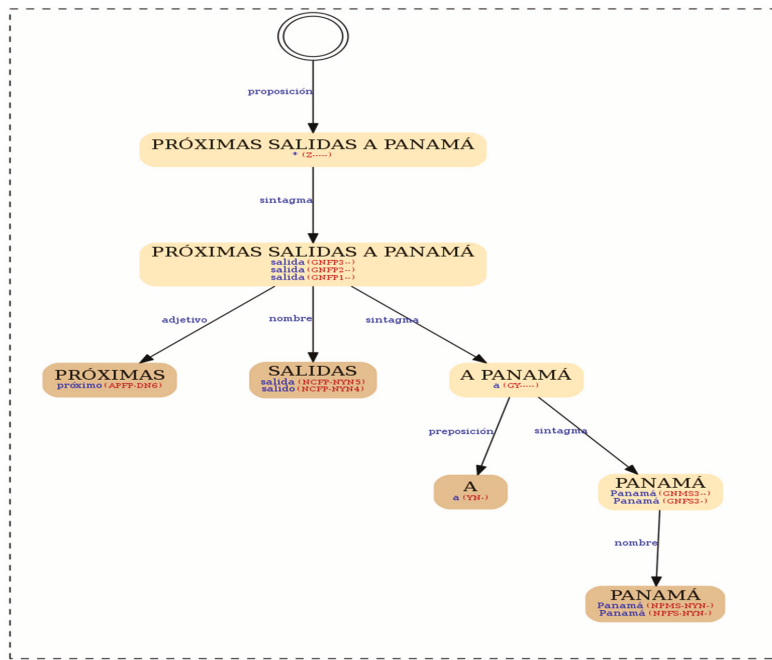


Figure 6. Example of grammatical disambiguation.

Finally, complementing the frequency distribution from the grammatical categories, the codification concludes by providing the repetition frequency per word, by following with Figure 7. These results refer to the apparent preference of the intermediaries to mainly promote air transportation services and hosting. This situation would not place sustainable tourism as the fundamental core and purpose because the words regarding values, identity, culture, and attractive spaces that the countries offer, showed a low repetition. For example, ‘airport’ was mentioned 840 times, in contrast

Recognizing the criteria similarities toward the valuation that the judges would give to the nouns, adjectives, and verbs. When a p-value close to zero was obtained for all the categories, as shown in Table 5, it reflected non-significance for Kendall's W. Consequently, several iterations were performed until an acceptable coherence value was obtained, as shown in Tables 6–8. This was undertaken due to the wide number of variables, which might suggest subjectivity, thus impeding the ability to obtain an acceptable coherence value.

Table 5. Criteria similarity according to grammatical categories.

Grammatical Category	Kendall's W Coefficient	# Judges
Nouns	0.133	20
Verbs	0.195	20
Adjectives	0.116	20

Table 6. Similarity coefficient for nouns.

The Best Combination of Evaluators	Kendall's W Coefficient	# Judges
E3–E7	0.522	2
E3–E7–E17	0.534	3
E3–E7–E17–E13	0.481	4
E3–E7–E17–E13–E16	0.628	5
E3–E7–E17–E13–E16–E18	0.690	6
E3–E7–E17–E13–E16–E18–E6	0.663	7
E3–E7–E17–E13–E16–E18–E6–E2	0.719 *	8

(*) Combinations that meet the similarity criterion for $\alpha = 0.70$.

Table 7. Similarity coefficient for verbs.

Best Combination of Evaluators	Kendall's W Coefficient	# Judges
E4–E13	0.380	2
E4–E13–E3	0.209	3
E4–E13–E3–E6	0.423	4
E4–E13–E3–E6–E11	0.537	5
E4–E13–E3–E6–E11–E15	0.627	6
E4–E13–E3–E6–E11–E15–E8	0.732 *	7
E4–E13–E3–E6–E11–E15–E8–E2	0.767 *	8
E4–E13–E3–E6–E11–E15–E8–E2–E9	0.802 *	9

(*) Combinations that meet the similarity criterion for $\alpha = 0.70$.

Table 8. Similarity coefficient for adjectives.

Best Combination of Evaluators	Kendall's W Coefficient	# Judges
E7–E13	0.356	2
E7–E13–E10	0.401	3
E7–E13–E10–E15	0.497	4
E7–E13–E10–E15–E18	0.586	5
E7–E13–E10–E15–E18–E6	0.712	6
E7–E13–E10–E15–E18–E6–E9	0.808 *	7

(*) Combinations that meet the similarity criterion for $\alpha = 0.70$.

From the valuations, the methodological trial finally provided new subsets of words that were grouped according to the sentiments shown in Figure 8. These grant a significant derivation and might represent the linguistic icons that should be used to promote sustainable tourism. This miscellaneous constitutes an important input of analysis in which to plan strategic marketing. Similarly, travel agencies might strengthen their business through the promotion of transportation and accommodation.

Tourists might be attracted by the promotions if nouns were used such as 'love', 'happiness', and 'friendship'; and adjectives like 'anthropological', 'ancestral', 'fun', 'exclusive', and 'delicious'.

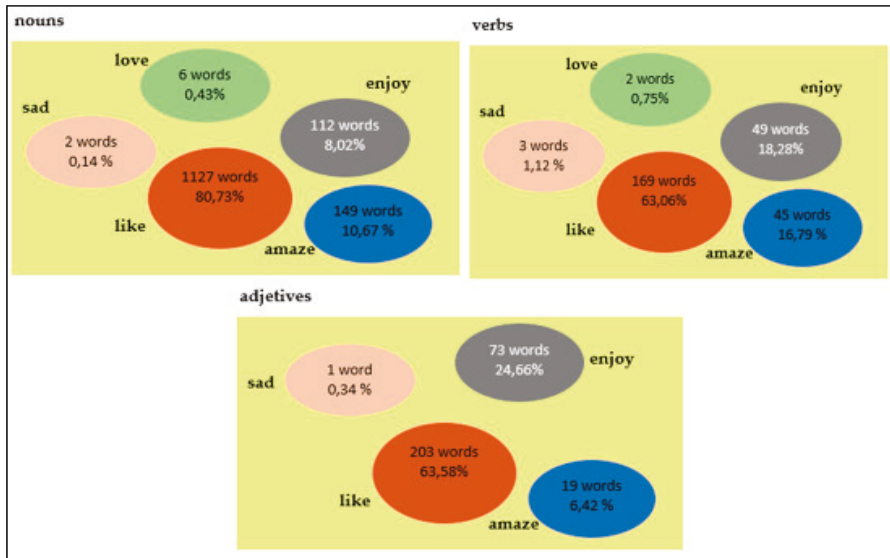


Figure 8. Set distributions according to the sentiment evaluation.

4.5. Predictive Analysis

The study conducted through K-S, as shown in Table 9, demonstrated that the frequency distribution for the grammatical categories was not adjusted to a homogenous reality with the significance level of $\alpha = 0.05$. This confirms the frequency polygons in Figures 9–11, which would justify the use of Chebyshev’s Theorem because it is independent of the type of distribution that the variable has [82]. Therefore, to accomplish the predictive analysis, the density functions were built through the equation tests of tendency, and the results are shown in the mentioned figures that correspond to those functions where the best level of adjustment for the determination coefficient was obtained as R^2 .

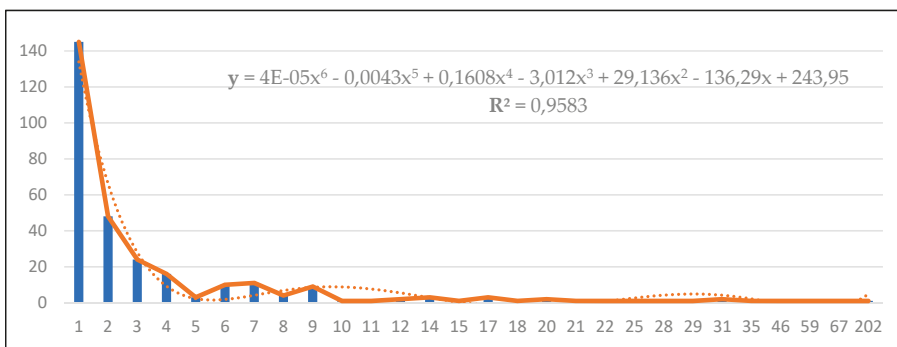


Figure 9. Adjective frequency distributions. Six-degree polynomial function.

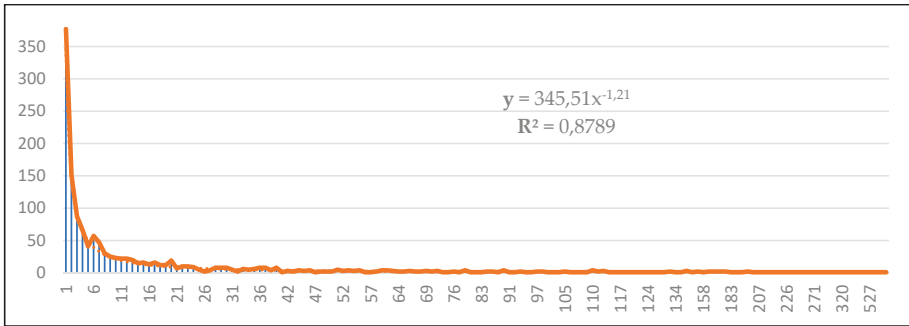


Figure 10. Noun frequency distributions. Potential function.

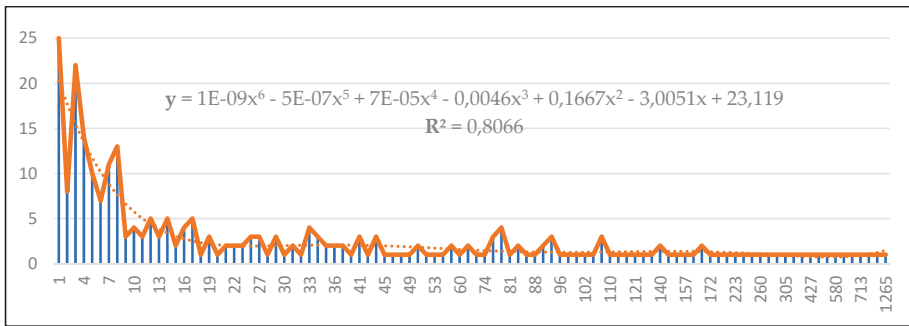


Figure 11. Verb frequency distributions. Six-degree polynomial function.

Table 9. Normality test.

Categories	Z Kolmogorov–Smirnov	p-Value
Adjectives	0.352	0.000
Nouns	0.376	0.000
Verbs	0.389	0.000

Where, after the determination of probabilities through density functions, they were obtained for the noun, adjective, and verb sets, and the position in which each word was placed on the marketing horizon. The results are exemplified in Table 10 and correspond to the terms that, from the analysis of feelings, received the highest assessment (love) that the tourist intermediary should try to reach the threshold, called ‘the top’.

In this way, the usefulness of the study allows for the recognition of words both in feeling and threshold of probability that could benefit advertising practices. Thus, for example, it could be assumed that the combination ‘Dream’ + ‘Enjoy’ + ‘Aquatic’ + ‘Ancestral’, would attract the attention of tourists and possibly represent benefits for both the intermediary company and the territory as it derives an approximate publication with the value and focus of sustainable tourism.

On the other hand, after the application of the prediction and probability models, words were discovered, for example, that turned out to be located at a threshold of ‘the novelty’ and that casually receive the best evaluation of feelings. This means that, after the study, travel agencies can use words in their advertising messages that, while being attractive to customers, also promote sustainable tourism.

Table 10. Predictive analysis.

Word	Set	Frequency	Probability Value	Probability Threshold	Status
Feeding	Nouns	19	0.61	2k	The consolidation
Lunch	Nouns	147	0.86	3k	The obsolescence
Love	Nouns	25	0.65	2k	The consolidation
Rainbow	Nouns	1	0	-1k	The new fashion
Happiness	Nouns	1	0	-1k	The new fashion
Friendship	Nouns	2	0.8	3k	The obsolescence
Aircraft	Nouns	9	0.49	2k	The consolidation
Amazon	Nouns	10	0.51	2k	The consolidation
Handicraft	Nouns	11	0.52	2k	The consolidation
Eat	Verbs	1	0	-1k	The new fashion
Dream	Verbs	6	1.66611×10^{-10}	-3k	The novelty
Enjoy	Verbs	115	-1.59091×10^{-8}	-3k	The novelty
Aquatic	Adjectives	5	4.1770×10^{-9}	-3k	The novelty
Aereo	Adjectives	202	1	1k	The top
Ancestral	Adjectives	7	4.26504×10^{-9}	-3k	The novelty

5. Discussion

The exploration and study of web content is a topic that contributes to intelligence, knowledge management, and business management. Technical areas might see this as advantageous because the representation of their reality tends to be objective. For social studies, this topic might be more complex because investigations such as the one presented here, base their experience on subjectivity and phenomenology analysis.

In this scenario, a previous semantic analysis conducted by [87] showed a contrast between supply and demand by using digital social network content, which facilitated the ability to attract travelers and promote the creation of new products to improve some brands. Therefore, to continue to manage value, this research complements the state of the art by mainly establishing an identification practice of the linguistic icons of social content inside the tourism context. This fact constitutes a base in which to go beyond the generation of Web 3.0 and Web 4.0 content, which were also of interest in this work.

Subsequently, an extraction and data analysis alternative was systematized through set theory and constructed from the discourse analysis theory. These theories contributed to codify and structure the information to forming a lexicon that represented the semantic value for sustainable tourism. It also sought to motivate the defense of the territory and cultural rescue precisely as part of that semantic value that, according to [91] and in accordance with the paradigm of essential marketing, advertising content favors a positive reaction to the enjoyment of travel and respect for the cultural, ethnic, geographical, and socio-economic diversity of the environment [92]. The contributions of this work, with the construction of signs that transform the traveler's psychology, have allowed for the generation of an interactive culture that provides apparent, circumstantial, and manifest evidence [70] that can be given, afterward, to the social-cultural system of the receptor. The findings of this work constitute part of the acculturation process [93] of social networks and in the paradigm of sustainability [94,95].

From a pragmatic point of view, it is evident that the advertising intentions of the studied intermediation agencies do not seem to be aligned with the purpose of sustainable tourism. The reality indicates, through linguistic signs in the sets of words, that the intermediaries prefer to contribute to building a better relationship with places of accommodation and transportation than with the country or territory. The semantic relationship did not observe a close connection with social identity and another paradigm that [93] acknowledged as city-brand, where the values and attractions are stimulated toward new development schemes.

Finally, focusing on the future, this investigation will continue with the development of a monitoring system, which will allow us to measure the evolution of the words within the scheme of the marketing life cycle. Additionally, it will be necessary to develop a study to prove that,

indeed, the semantics of development and sustainable tourism favors the commercial activity of the intermediary companies. What this study expects is to start a configuration of artificial analytics based on qualitative data mining, whose main objective is to structure deterministic and probabilistic rules that, through the application of structural equation models (SEM) and expert stochastic models, favor not only the construction of algorithms and automated platforms for the extraction and analysis of the data, but also for the reply of the information.

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

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Article

Forecasting Hotel Accommodation Demand Based on LSTM Model Incorporating Internet Search Index

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Abstract: Accurate forecasting of the hotel accommodation demands is extremely critical to the sustainable development of tourism-related industries. In view of the ever-increasing tourism data, this paper constructs a deep learning framework to handle the prediction problem in the hotel accommodation demands. Taking China's Hainan province as an empirical example, the internet search index is used from August 2008 to May 2019 to forecast the overnight passenger flows for hotels accommodation in Hainan Province, China. Forecasting results indicate that compared to benchmark models, the constructed forecasting method can effectively simulate dynamic characteristics of the overnight passenger flows for the hotel accommodation and significantly improve the forecasting performance of the model. Forecasting results can provide necessary references for decision-making in tourism-related industries, and this forecasting framework can also be extended to other similar complex time series forecasting problems.

Keywords: internet search index; deep learning framework; LSTM model; hotel accommodation demands; forecasting performance

1. Introduction

The tourist hotel is an important part of the tourism industry. The tourist destination hotels flow is the indicator of hotel revenue; accurate passenger flow forecasting is the key link in the hotel revenue management [1], which helps related companies and organizations allocate limited tourism resources scientifically and reasonably to maintain market competitiveness [2]. However, the tourism demands such as the overnight passenger flow of hotels has characteristics of complex nonlinear fluctuations. The uncertainty of the passenger flow during the tourist season makes the decision-making of relevant departments into a dilemma, either overestimating or underestimating of the passenger flow will result in unnecessary waste of resources in tourism-related industries; additionally, the actual overnight passenger flow released by the statistical department has serious hysteresis. On the other hand, existing non-linear prediction methods are difficult to adapt to the increasing experimental data, and unable to extract feature information automatically, affecting the forecasting accuracy. With the all-round development of the Internet, a large amount of online query index generated by the consumer information search provides a new direction for an overnight traffic forecasting of tourist hotels [3]. This study addresses the aforementioned problems and expands the previous research by introducing appropriate nonlinear forecasting methods and constructing deep learning (DL) forecasting frameworks.

Existing prediction methods of tourism demands include linear and nonlinear technologies. Linear forecasting technologies mainly include the time series forecasting models represented by the autoregressive integrated moving average (ARIMA) and econometric models. Nevertheless,

these methods need to meet the stability of the economic environment and the stability assumptions of the time series. In practice, it is often unable to fully simulate complex nonlinear characteristics of the destination demands [4]. The nonlinear technologies represented by the regression version of the support vector machine (SVR) method have certain nonlinear forecasting abilities when dealing with small sample data sets [4–6], but these methods are shallow learning technologies. Hence, in the aspect of practical applications, it's hard for these methods to meet the growing data samples. Additionally, these methods cannot automatically extract features information, but also easily fall into the local optimum as well as over-fitting problems.

With the comprehensive development of the Internet, the information query has become a crucial basis for decision-making [7,8]. A large number of records generated by information query possess real-time and accessible features. These data mainly from the Baidu or Google search engine are objective reflections of consumers' latent demands for travel and have become increasingly important for tourism demand forecasting [3].

Existing literatures mainly use the consumer search data to forecast the tourist flow in scenic areas. Predictive results based on the linear model suggested that the Internet search index can improve the forecasting performance [9–13]. For instance, Yang et al. [11] applied the web index from Google and Baidu as input sets of the ARIMA model for a comparative study on the Chinese tourist volume. Huang et al. [12] used the query data from Baidu as a predictive variable of the ARIMA model to forecast the tourist arrivals of the Imperial Palace in Beijing. Taking Xi'an as an example, Wei and Cui [13] used the seasonal adjustment method to explore the correlation between the search data from Baidu and the tourist flow. However, the linear model needs to satisfy the stationary assumption of the time series and the stable economic environment, and it is difficult to effectively simulate the nonlinear relationship of tourism demands.

In order to cope with the nonlinear, existing literature used the Internet query index as input sets of nonlinear tools such as the artificial neural network (ANN) and the regression version of the support vector machine, to predict the tourist flow [5,6,14]. For example, Sun et al. [6] applied the web query data to construct a single-layer feed-forward neural network (FFNN) to simulate the tourist flows in Beijing. The empirical analysis shows that the search query data can effectively fit the dynamic characteristics of the tourist arrivals and improve the predictive accuracy of the constructed method. Li et al. [14] developed a composite forecasting tool using the back propagation algorithm (BPNN) and used the Baidu index to predict the tourist volume. Despite this, models such as the SVR and ANN are essentially shallow learning methods that are difficult to meet the growing samples of the tourism data, and challenge the predictive accuracy.

Previous studies forecasted the demands of tourist hotels mainly based on linear models [15–19]. For example, Choi [18] identified key economic indicators of the hotel industry in the US and built synthetic indicators to forecast the US hotel demands successfully. Aliyev et al. [19] used fuzzy time series models to forecast the hotel occupancy. There was very rare research specializing in the hotel demand forecasting using the Internet search data. For example, Pan et al. [20] utilize the Google trend index as model inputs to forecast the hotel occupancy. The results indicated that the addition of network queries can obviously reduce the prediction error. However, these studies mainly use the Google trend data as predictive variables of linear models. In China, consumers mainly use the Baidu search engine for information search. There is no relevant literature using the Baidu search data to forecast the demands for the tourist hotel accommodation. Whether the Baidu search data has a predictive effect on the demands of tourist hotels remains to be investigated. In addition, with the increase in the data samples, linear-based forecasting techniques are difficult to fully simulate the nonlinearity of the hotel accommodation demands.

In recent years, with the popularity of artificial intelligence, neural network models with more hidden layers can learn the characteristic information and the relevance behind the complex dataset. The DL technology has attached increasing importance in both academia and the industry [21]. According to the consensus of most current researches, for traditional machine learning algorithms,

as the data sample increases, the forecast performance increases according to the power law, but tends to be stable after a while. But for the DL method, its performance increases logarithmically with the increased sample capacity [22]. Compared to other DL models, the long short-term memory (LSTM) exhibits unique advantages in terms of forecasting with sequence as inputs [23–25]. In the field of tourism, for example, Chang and Tsai [26] used the deep neural network (DNN) model based on official statistics to forecast Taiwan’s tourist flow. There is no research on the hotel accommodation demand forecasting based upon such DL methods.

The application of the DL models in the complex time series forecasting of tourism demands is explored in this paper. Taking Hainan as an example, the internet search data generated by the consumers’ information search and LSTM models with excellent forecasting ability for the complex time series are used to forecast the overnight passenger flows of tourist hotels. For the purpose of comparing the forecasting power of the developed models, the deep belief network (DBN), BPNN, and C-LSTM (only using past observations of the overnight passenger flow as predictive variables) were constructed as benchmark counterparts. With the empirical results suggesting that the developed LSTM network can effectively forecast hotel demands compared to its competitors.

The contribution of this study to the existing research is twofold. Firstly, we construct a theoretical analysis framework based on the tourism motivation theory and information search behaviour theory for the first time, which provides a theoretical basis for the tourism demand forecasting research based on the web search data. Secondly, unlike previous studies, forecasting tools such as the ANN and SVR cannot adapt to the ever-increasing tourism data. This paper introduces the LSTM with an excellent prediction ability for the complex time series data and constructs an empirical analysis framework to forecast hotel accommodation demands. This method provides a feasible solution for other complex time series predictions under relatively large sample conditions.

The rest of the study proceeds as follows: Section 2 is the theoretical analysis. In Section 3, the design of the forecasting method is shown. Section 4 gives the empirical results of the overnight passenger flow forecasting. Section 5 presents the conclusions.

2. Theoretical Analysis

It is observed from the tourism motivation theory [27,28] and tourist information search behavior theory [7,29] that tourism is a dynamic process in the temporal and spatial dimension, which can be divided into three stages namely, the pre-tour plan, in-tour experience and post-tour evaluation. The logic framework of the tourist information search is shown in Figure 1.

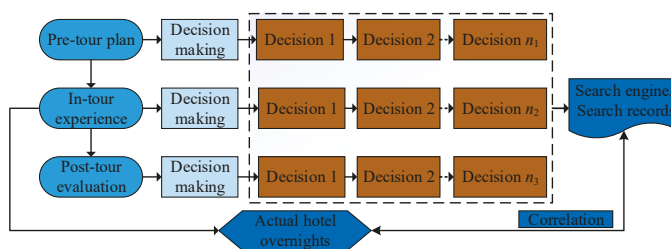


Figure 1. The logic framework of the tourist information search.

The decision-making of tourism at each stage in the Internet environment relies heavily on the Internet information search. Once a tourism decision is made, tourists will try to fulfill their specific tourism demands. The pre-tour plan refers to a series of plans made by the consumers inspired by the tourism demands. They make tourism decisions by using the Internet to search information thereby, developing an optimal travel plan. The in-tour experience refers to the entire tourism implementation process from the source to the tour destination. It is the process of the tourists’ actual experience on tourism products and services. At this stage, tourists mainly use mobile communication devices such

as mobile phones and tablet phones to inquire the tourism-related information they care about, thereby making travel decisions. Post-tour evaluation is an objective evaluation of witnessed tourism products or services after the end of the tour, visitors often use various social media tools to comment on tourism products and services and share their travel experiences.

Jeng and Fesenmaier [30] noted that in the whole process of the pre-tour plan and in-tour experience, tourists would make different tourism decisions for six elements of tourism such as eating, accommodation, transportation, travelling, shopping and entertainment. During this process, the tourists' potential tourism demands are expressed by the Internet information search on the search engine, which makes a true record of the search information. The consumer information search objectively reflects the tourists' potential travel motivation. The characteristic information that has the potential influence on the tourism demands can be determined from the Internet information search. The information is the pre-reflection of the passenger flow of tourists destination hotels hence, it becomes an important data source in tourism demand forecasting [3].

3. Design of Forecasting Method

3.1. LSTM Network

The advantage of the traditional recurrent neural network (RNN) model is that it can learn complex temporal dynamic characteristics through the following recurrent equations when dealing with forecasting tasks of sequence input objects:

$$Z_t = f(W_{xz}X_t + W_{zz} + b_x) \quad (1)$$

$$Y_t = f(W_{yz}Z_t + b_y) \quad (2)$$

where, X_t represents the inputs of the model, Z_t denotes a hidden layer with the N hidden units, Y_t denotes the output at the moment t, and (W, b) represent the weight and offsets parameters that need to be learned. For the input sequence with the length T, the update of the data is handled in a cycle way.

Although RNN has been successfully applied in areas such as speech recognition as well as text generation [31,32], this method has some difficulties in learning and storing long-term memory information, which can be attributed to disappearing and the explosion of gradients when RNN is optimized in some time steps. The consequence is that the model cannot retain the past memory information over a long time.

LSTM is a variant of RNN, proposed by Hochreiter and Schmidhuber [23] whose core contribution is the introduction of the ingenious concept of self-looping. LSTM provides a solution for a fusion memory cell unit that allows the network to learn the previously forgotten hidden unit and update the hidden unit based on the new information. In addition to the hidden unit Z_t , the LSTM network also includes the input gate, forgotten and input adjustment ones, and memory cell. The memory cell unit fuses the state of the previous memory cells, these memory cell units are adjusted by the forgotten gate and the input adjustment gate as well as the previous hidden state, which is adjusted by the input gate. These additional memory cell units enable the LSTM architecture to learn extremely complex long-term time dynamics, ensuring the long-term memory function of the LSTM. The architecture of an LSTM model can be expressed as follows:

$$F_t = \sigma(W_f^T \cdot [Z_{t-1}, X_t] + b_f) \quad (3)$$

$$I_t = \sigma(W_i^T \cdot [Z_{t-1}, X_t] + b_i) \quad (4)$$

$$\bar{C}_t = \tanh(W_c^T \cdot [Z_{t-1}, X_t] + b_c) \quad (5)$$

$$C_t = F_t \otimes C_{t-1} + I_t \otimes \bar{C}_t \quad (6)$$

$$Z_t = O_t \otimes \tanh(C_t) \quad (7)$$

$$\tanh(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}} \quad (8)$$

where, tanh represents the activation function.

The biggest contribution from RNN is the increased hidden state C_t in LSTM, which determines how much information to add or remove from the previous memory state by using the sigmoid activation function $\sigma(x) = (1 + e^{-x})^{-1}$ and the point multiplication defined layer. The first gate is the forgotten gate $F_t \otimes C_{t-1}$, which controls how much data is discarded from the previous memory state. This is followed by the input gate, which remembers some of the current information and determines which values will be updated. Then, new cell state merges the past and present memory information and selects the information of vector $[Z_{t-1}, X_t]$ through the forgotten gate, which provides a mechanism for deleting past irrelevant information and adding relevant information from the current time step. Finally, the output layer $O_t \otimes \tanh(C_t)$ controls how much memory data will be utilized in the update of the next phase [33].

3.2. Training Method and Model Selection

The back propagation through time (BPTT) commonly used in the RNN network was adopted to train the LSTM network, which is the standard algorithm for training RNN-like network models. The RMSProp, an improved stochastic gradient descent algorithm, was selected for parameter iterative updating. In the LSTM network, in addition to the default activation functions of the model, the other layers use the tanh function as the activation function, which has a more stable gradient and is commonly used in the regression problem.

Over-fitting is an unavoidable phenomenon in the field of DL. The Dropout algorithm developed by Hinton et al. [34] was utilized for solving this defect. This method is a model selection algorithm and a powerful tool to solve the over-fitting in the current DL field.

3.3. Forecasting Framework Construction

After the introduction of the LSTM model, a prediction framework based upon consumer queries was constructed (as shown in Figure 2). This framework illustrates the entire empirical analysis, including keyword selection, variable observations acquisition and cleaning, keyword variable screening, predictive variable selection, experimental dataset construction, forecasting experiment and predictive accuracy test. The detailed steps are as follows:

Step 1: Experimental dataset acquisition. After determining the search engine, for the purpose of handling the information omission, we selected six elements related to the destination as the benchmark queries, and then inquired extended keywords related to the benchmark keywords circularly. Eventually, we used Python to crawl the structured query volume data of each keyword, and obtained an alternate experimental dataset composed of data of the overnight passenger flow of tourist hotels.

Step 2: Data cleaning. The passenger flow is very sensitive to promotion schemes, emergencies, etc., thereby data may have abnormal values in different periods. In addition, some keyword variables or predicted variables have the problem of missing data, which will affect the prediction of the model. Thus, the individual outliers were replaced by the moving average method, which eliminated the influence of the noise while retaining the basic data characteristics.

Step 3: Predictive variable screening. In order to further find predictive variables that are significantly correlated with the predicted variables, the cross-correlation analysis was used to analyze the connection between the keyword variables and lag variables of the predicted variables. The Pearson cross-correlation analysis is a statistical analysis method, which acquired the Pearson correlation coefficient between the 1–12 order lag variables of the predictive variable and the predicted variable,

respectively. The lag variable corresponding to the maximum correlation coefficient was taken as an alternate predictive variable. The threshold m was defined, and the keyword variable with the correlation coefficient exceeding m was retained as the keyword predictive variable. The same method was used to find the lag variable of the predicted variable as the predictive variable.

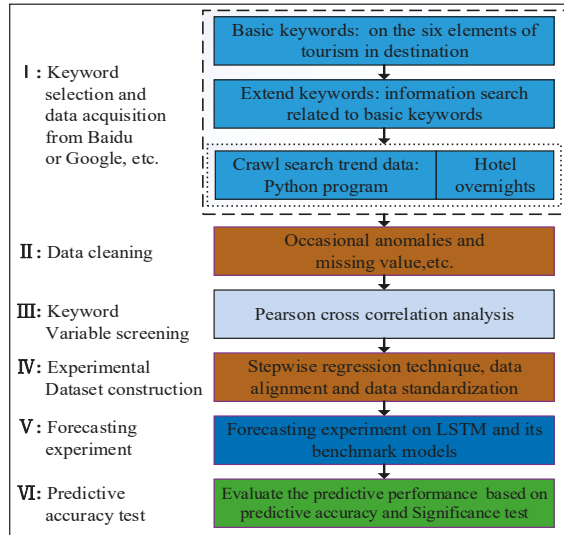


Figure 2. Logic diagram of the forecasting framework.

Step 4: Experimental dataset construction. For the purpose of reducing the complexity of model training, the stepwise regression analysis was further performed on the potential predictive variables to obtain the final predictive variable with excellent predictive ability. To reduce the training complexity, help the network converge faster, and reduce the prediction error rate, a standardized method $(x_t - x_{min}) / (x_{max} - x_{min})$ was used to standardize the experimental dataset, where x_t represents the value of the time series in the experimental dataset at point t , x_{min} , x_{max} represent the minimum and maximum values of x_t , respectively. Eventually, all the standardized variables were then aligned based on the optimal lag structure of each variable and composed experimental dataset.

Step 5: Forecasting experiment. The experimental sample was split into the training section and the test section. The former was utilized for training and the latter was utilized for the predictive test. Predictive experiments were conducted under the Keras framework [35].

Step 6: Predictive accuracy test. The predictive accuracy was determined by metric indices including the root mean squared error (RMSE), mean absolute percent error (MAPE), relative mean bias (PBIAS) and goodness-of-fit index R. The calculations of these statistical indicators are shown in Equations (9) - (12). A significant test of the difference in the predictive accuracy between LSTM and its benchmark models was performed using the Paired t test [36].

$$RMSE(y_t, \hat{y}_t) = \left[\frac{1}{N} \cdot \sum_{t=1}^N (y_t - \hat{y}_t)^2 \right]^{\frac{1}{2}} \tag{9}$$

$$MAPE(y_t, \hat{y}_t) = \frac{1}{N} \cdot \sum_{t=1}^N \left| \frac{y_t - \hat{y}_t}{y_t} \right| \cdot 100\% \tag{10}$$

$$PBIAS(y_t, \hat{y}_t) = \frac{\sum_{t=1}^N (y_t - \hat{y}_t)}{\sum_{t=1}^N y_t} \cdot 100\% \tag{11}$$

$$PBIAS(y_t, \hat{y}_t) = \frac{\sum_{t=1}^N (y_t - \bar{y})(\hat{y}_t - \bar{Y})}{\sqrt{\sum_{t=1}^N (y_t - \bar{y})^2} \sqrt{\sum_{t=1}^N (\hat{y}_t - \bar{Y})^2}} \quad (12)$$

where, y_t , \hat{y}_t represent the actual tourist flows and simulated records, respectively, N represents the forecasting period, and \bar{y} , \bar{Y} are the average of y_t , \hat{y}_t , respectively.

The absolute indicator RMSE and the relative indicator MAPE were designed to determine the forecasting accuracy between the actual and the fitted records. The smaller the score, the higher was the predictive accuracy [5]. The relative metric indicator PBIAS measured the average result of the deviations between the fitted and actual observed values [37]. The expected score of the PBIAS was zero. The positive and negative scores implied underestimating or overestimating the actual passenger flow in the sense of average, respectively. The purpose of R was to describe the goodness of fit between the predictive and the predicted variables. The closer its score to one, the better was the simulating effect.

4. Case Study

4.1. Collection and Analysis of Experimental Data

For the purpose of confirming the validity of the constructed prediction framework, China's Hainan province was selected as an application case in this paper to forecast the overnight passengers flow to tourist hotels. Hainan is an excellent tourist destination in the southernmost part of China. In 2018, the added value of the tourism industry in Hainan was 39.282 billion Yuan with annual increase of 8.5%. Tourism hotels received 40.256 million passengers with a year-on-year increase of 7.5%. The monthly passengers flow varies significantly with the seasons. The lower monthly passengers flow was less than 1 million passengers, which increased in the tourism-peak season to over 4 million, the periodic non-linear fluctuation characteristics of the slack and boom season were obvious. The overnight passengers flow data of hotels comes from the leading financial database Wind in China. Considering the availability of the network search data, the data collection time ranged from August 2008 to May 2019.

Similar to the Google trend, the Baidu Index (<http://index.baidu.com>) provides the daily and weekly index with absolute data. These data are real-time, more sensitive to tourists' behavior, and more reflective of tourists' potential tourism demands [5], offering preferable data support to researchers for tourism demand forecasting. In step 1, of the forecasting framework, 82 keywords related to the Hainan tourism were selected, and a weekly query volume of the keyword search from August 2008 to May 2019 was crawled through the Python program, which was converted to a monthly data by the average weighted summation method. Taking the threshold $m = 0.8$, and eight keyword variables and the 1–2 order lag variables of the predicted variables obtained through step 2–4 were taken as the final predictive variables.

Figure 3 shows the dynamic fluctuation trend between the two keyword variables of "Hainan map" as well as "Hainan fruit" and the predicted variables, respectively. From this figure, the Internet information search and the overnight passenger flows of the tourist hotel receptions exhibited cyclical fluctuations, the fluctuation trend was consistent, and each cycle exhibited a complex nonlinear characteristic. The fluctuation characteristics of different keyword variables had slight differences, which indicated that the information implied by the keywords had heterogeneous characteristics, and different information queries reflected different tourism demands of tourists. Additionally, due to the warm season of winter in Hainan, each year the passenger flow was at peak in January and December, and the school summer vacations lead to small peaks in July each year.

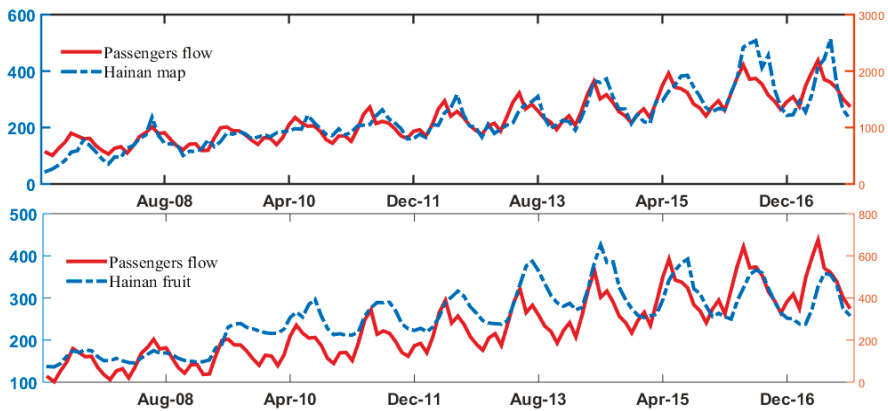


Figure 3. Trend diagram between the “Hainan map” as well as the “Hainan fruit” and predicted variables.

The correlation analysis between all the predictive variables and the predicted variables in the experimental dataset is listed in Table 1. It can be seen that the lag order of the keyword predictive variables obtained by the cross-correlation analysis was 0–5, most of them were 0–1, and these variables had a significant correlation with the predicted variables, which fully reflected the potential tourism demands of tourists. For example, tourists inquired about travel guides, weather, maps and scenic spots information about one month in advance. Considering the periodic nonlinear characteristics of the forecasted variable and the excellent predictive ability of LSTM for the complex time series, it was assumed that the selected keyword variable as the input set of LSTM can effectively forecast the overnight passengers flow of tourist hotels. According to step 4 in the forecasting framework, the standardized dataset finally used in this paper can be expressed as follows:

$$\Omega = \{y_{-1}, y_{-2}, x_1, x_2, \dots, x_8; y\} \tag{13}$$

Each of which contains 125 observations, where, $y_{-1}, y_{-2}, x_1, x_2, \dots, x_8$ refer to the predictive variables, and y refers to the predicted variable. Each variable is aligned according to the lag order. The first 113 sample points in the experimental dataset Ω were used for training, and the last 12 months of data were used for the testing.

Table 1. Correlation analysis of the predictive variable.

No.	Predictive Variable	Code	Lag Order	Correlation	t-Value	p-Value
1	One-order lag of y	y_{-1}	1	0.915 ***	25.179	<0.01
2	Two-order lag of y	y_{-2}	2	0.806 ***	15.127	<0.01
3	Sanya weather	x_4	0	0.877 ***	20.262	<0.01
4	Hainan map	x_1	0	0.873 ***	19.820	<0.01
5	Qionghai	x_3	1	0.864 ***	19.049	<0.01
6	Hainan weather	x_7	0	0.856 ***	18.354	<0.01
7	Sanya attractions	x_5	1	0.823 ***	16.079	<0.01
8	Sanya Self-driving tour	x_8	1	0.811 ***	15.369	<0.01
9	Hainan coconut	x_2	5	0.773 ***	13.528	<0.01
10	Hainan fruit	x_6	0	0.756 ***	12.433	<0.01

Note: *** indicates significance at 1% level.

4.2. Benchmark Models and Experimental Setup

For the purpose of confirming the forecasting power of the LSTM network under the forecasting framework, DBN, BPNN and the C-LSTM models were constructed as benchmark counterparts. Among them, DBN was a non-convolution architecture using deep framework training successfully [38], which was essentially a generation network. DBN was introduced to illustrate the advantages of LSTM in the complex time series forecasting. BPNN is a shallow learning method with only one hidden layer. It is a FFNN model and adds a BP algorithm to the structure of the feed-forward network. The introduction of BPNN was aimed to compare the forecasting ability of the DL technology with that of shallow learning methods. C-LSTM however, used only the historical data of the predicted variables as the model inputs, which was introduced to further confirm the importance of the Internet search data.

In terms of the experimental setup, to solve the phenomenon of over-fitting, the randomization selection rate of Dropout for the hidden layer was set to 0.5 for regularization [34]. For the purpose of compromising between the complexity of model training and the local optimal solution, according to the recommendations of Hinton et al. (2012), the initialization learning rate of all models was set to one. BPNN used the classical gradient descent algorithm (GDA) to optimize parameters, and the other forecasting tools used the RMSProp for an iterative updating of the parameters [34]. Taking into account a fewer experimental dataset, the batch size was set to four. In terms of the activation function, tanh was utilized as the activation function of all layers in the BPNN. In addition to the default activation function of the model, the other three models used the tanh function as the activation function of all layers. For the purpose of ensuring the convergence of the loss function RMSE when iteration was stopped during the model training process, epoch was set to 150. Except that the BPNN was a shallow learning model with only one hidden unit, the rest were the DL network architecture with three hidden units.

4.3. Empirical Results and Discussion

According to step 5 of the forecasting framework, the training experiment was conducted on the training dataset, the optimal architecture after training was used as the predictive model to perform the predictive test. The prediction outcomes of the various models on the testing dataset are displayed in Table 2. The monthly optimal forecasting values are shown in bold. For the 12-month forecasting results, LSTM performed the best. The optimal forecasting results of LSTM, DBN, BPNN and C-LSTM were five, four, two and one month, respectively. Figure 4 demonstrates the forecasting curve of each model on the test dataset more intuitively. Overall, LSTM better fits the dynamic characteristics of the passenger flow whereas, the C-LSTM performs the worst, and all the benchmark models had a slightly poor fit performance in the last five months. The specific predictive power of each network is yet to be analyzed from the statistical indicators.

Table 2. Predictive results of each model.

Time	Actual Flow	LSTM	C-LSTM	DBN	BPNN
June 2018	264.05	259.591	269.049	266.342	269.113
July 2018	291.06	298.493	280.918	283.213	281.788
August 2018	308.65	317.591	295.308	319.315	299.221
September 2018	274.63	265.681	283.574	286.209	265.477
October 2018	347.47	340.195	340.314	335.343	338.275
December 2018	395.29	403.600	404.685	402.440	390.739
November 2018	437.74	443.652	430.186	444.988	450.599
January 2019	370.66	377.013	385.391	358.045	379.493
February 2019	360.36	348.891	344.764	369.626	347.134
March 2019	339.01	330.525	330.551	331.271	330.509
April 2019	301.81	309.101	319.596	289.241	313.687
May 2019	278.30	286.992	289.207	285.083	289.161

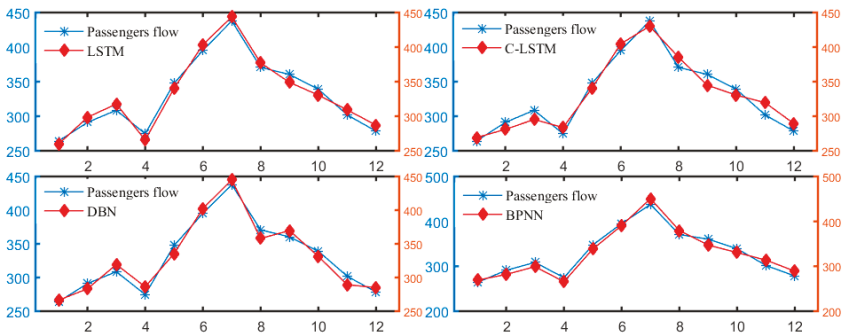


Figure 4. Comparison of the fitting curves of the various models.

To further explore the predictive power of our proposed method, the statistic scores calculated on the experimental dataset are shown in Table 3, and the best score for each metric indicator was indicated in bold. In general, in addition to PBIAS, LSTM exhibited best on the scores of the other metric indicators. It is worth noting that the predictive accuracy of LSTM and DBN on the test set was better or very close to that of the training section, but the other three models are just the opposite, which suggests LSTM and DBN had a better generalization performance.

Table 3. Metric indicator scores for each model on the experimental dataset.

Model	RMSE		MAPE (%)		PBIAS (%)		R (%)	
	Train	Testing	Train	Testing	Train	Testing	Train	Testing
LSTM	8.015	7.983	2.501	2.407	0.143	−0.310	0.990	0.989
C-LSTM	9.922	11.363	3.297	3.311	−0.049	−0.114	0.979	0.975
DBN	9.450	9.462	2.750	2.754	−0.051	−0.053	0.988	0.984
BPNN	9.637	9.743	2.758	2.885	0.227	0.349	0.985	0.984

On the testing dataset, the LSTM score was the smallest and the C-LSTM score was the highest in terms of the RMSE and MRE indicators, indicating that the deviation between the predicted record and the actual observation of LSTM was smaller with a better predictive accuracy than the benchmark models while, C-LSTM had the worst predictive accuracy. In terms of the goodness-of-fit indicator R, four models performed very close, and can fit the passengers flow well, but the fitting effects of LSTM and C-LSTM were the best and worst, respectively. In terms of PBIAS, the scores of all the models were small and all the score ranking were “excellent” [39]. However, C-LSTM and DBN performed better, while BPNN exhibited the worst. Except that BPNN underestimated the actual value on an average, the other three models overestimated the actual value on average.

4.4. Predictive Accuracy Test among Groups

In order to determine whether there exists a sharp distinction in the predictive accuracy between LSTM and its counterparts, the percent error $\Delta = (y_t - \hat{y}_t) / y_t$ of each network was applied for the t-test, where y_t and \hat{y}_t represented the actual passenger flows and the predicted values, respectively. The essence of the t-test was to confirm whether the average value of the predictive accuracy between the developed network and each benchmark counterpart was equal. The following statistical assumptions were made:

Hypothesis 0 (H₀). *There is no difference in the predictive accuracy between LSTM and the benchmark model.*

Hypothesis 1 (H₁). *The predictive accuracy between LSTM and its competitor model is not equal.*

The testing outcomes are illustrated in Table 4. As seen from the table, the 10% significance level rejects the hypothesis that the predictive accuracy between LSTM and DBN is equal; while for LSTM, C-LSTM and BPNN, the 5% significance level rejects the null hypothesis. This implies that there exists an obvious distinction in the predictive accuracy between the constructed method and its competitors.

Table 4. Test of significance between LSTM and its competitors.

Model	M_Diff	t-Statistic	p-Value
C-LSTM	-4.434×10^{-4} **	-3.046	0.013
DBN	-2.045×10^{-3} *	-0.177	0.064
BPNN	8.691×10^{-4} **	-2.263	0.044

Note: M_Diff represents the mean of the relative error between LSTM and its competitor model; ** and * respectively denote significance at 5% and 10% levels.

In general, because the LSTM model can detect and learn the long-time dynamic information of the time series, it produces minimum error rate for the monthly passengers flow with periodic fluctuation characteristics, which agree with the conclusions of Aggarwal and Aggarwal [24] as well as Heaton et al. [40]. As C-LSTM failed to utilize the consumer query index as its inputs, its predictive accuracy was obviously different from that of LSTM at a 5% level of significance, and the error rate MAPE on the test section increased by 27.303%, which fully proved that the addition of the search query data drastically improved the forecasting performance of the models thereby, further confirming the conclusions of Zhang et al. [5] and Law et al. [25]. BPNN had a poor predictive ability due to its difference in the model structure from the DL method. Due to the disadvantages of the DBN in learning and storing long-term information, the learning ability of DBN was slightly worse than that of LSTM, and the predictive accuracy was slightly different at the 10% level of significance.

5. Conclusions

Hotel accommodation demands exhibit a cyclical fluctuation and complex nonlinear characteristics. Considering that the traditional prediction techniques cannot meet the ever-increasing data samples, and unable to automatically extract feature information, a forecasting framework based on DL was constructed in this paper. Taking Hainan in China as an empirical example, the LSTM model with a good predictive power for the complex time series was developed, and the Internet query index was used as the model inputs to forecast the overnight passengers flow of tourist hotels. The experimental outcomes implied that as compared to the benchmark models, LSTM improved the model predictive ability to different degrees, displayed satisfactory prediction ability and powerful generalization, and can simulate the dynamic characteristics of the passenger flow as well.

The preferable forecast performance can be attributed to the following three aspects. Firstly, additional memory units and special network structures enable the LSTM to learn the complex dynamic information of the passengers flow time series with a relatively large sample. Therefore, as compared to the DBN model, the LSTM model can learn the characteristic information of the passenger flows, which obviously improves the predictive ability of the model. Secondly, with the advent of the Internet environment, the consumer's information query objectively reflects the potential demands for travel, and can forecast the trend of the overnight passenger flows of tourist hotels in advance. Therefore, the incorporation of the network query index makes the LSTM model better fit the dynamics of the overnight passenger flow in tourist hotels, and significantly improves the predictive performance of the developed LSTM network, which agree with the theoretical analysis. Finally, different optimization algorithms and a special network structure design make the learning ability and predictive ability of the LSTM significantly different from that of BPNN.

The research in this paper has a prominent theoretical significance. Firstly, an empirical framework based on web queries was constructed for the ever-growing sample of tourism data. Secondly, the LSTM deep learning model was introduced for the first time to forecast the hotel accommodation

demands, extending the application of DL methods in hotel demand forecasting. Finally, it is confirmed that LSTM can simulate the relationship between the Internet queries and the tourism demands of hotels. This breaks through the limitations of the traditional forecasting technology and provides a typical application case for the deep integration of tourism data with a relatively large dataset, artificial intelligence and real economy.

As far as applications are concerned, the constructed forecasting framework provides a new solution for the hotel accommodation demand forecasting done by managers of tourism-related departments under the Internet environment, which helps tourism-related departments to dynamically monitor the hotel overnights; it provides decision support for realizing the information of the destination management. In addition, the constructed empirical framework can be used to forecast other destination demands such as hotel revenues, etc. It can further be extended to other similar prediction fields.

Nevertheless, in the context of the voluminous data, there may be other characteristic information that may reflect the tourists' potential tourism demands. In future research, it is necessary to further expand other sources of information reflecting the dynamic characteristics of the hotel accommodation demands. In addition, the volume of the available sample data collection limits the research results. As the data sample further increases, the validity of the empirical framework can be tested by the actual cases.

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Article

“On Holidays, I Forget Everything... Even My Ecological Footprint”: Sustainable Tourism through Daily Practices or Compartmentalisation as a Keyword?

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Abstract: In today’s struggle against climate change and for less dependence on fossil fuels, why do people who adopt practices with a lower impact on the environment forget them during their holidays? This contribution sheds new light on sustainable tourism by focusing on daily practices during holidays. Based on the concrete practices of holidaymakers, this contribution proposes to understand some factors and contexts favouring the persistence, the transformation or the abandonment of sustainable practice(s) during holidays. The theoretical framework of this research mainly draws on social practice theories. The empirical material is made of 38 biographical in-depth and crossed interviews: twenty on daily practices with young adults (25–35 years old) who have adopted at least one more sustainable daily practice and who went on holidays for the past year reinforced by 18 interviews with some of their parents.

Keywords: tourism; compartmentalisation; sustainable daily practices; young adults

1. Introduction

Alternative consumption is of growing interest in today’s society and every area seems to be affected. Eating local products, saving energy, wearing second hand clothes, and shopping in bulk have become fashionable and encourage new forms of practices. Tourism is not to be outdone. With the rise of this new way of consuming and travelling, the adoption of practices with a lower impact on the environment could be considered as a homogeneous and common phenomenon. The purpose of this article is to show that it is not the case, as demonstrated by comparing practices in the everyday life and practices during holidays. Do the more sustainable practices adopted during daily life persist during touristic holidays? How and why?

For the last twenty years or so, there is an abundant scientific literature on sustainable consumption [1–4] and “green” tourism [5–7]. Nevertheless, over the last decade, these first waves of research have been widely criticized [8–13], particularly because they systematically consider that the individual is the main driver of change. This article is part of this critical movement in applying social practice theories [14,15] as a theoretical framework.

The second special feature of this article is that it develops a theme that is not yet well explored, namely the persistence of sustainable practices during holidays. Indeed, while there is research on the relationship between tourism and the ecological footprint [16–18], or between tourism and transport use [19–21] and still other studies on sustainable tourism practices [22–25], there is very little research linking home-based and tourism-based sustainable practices [10,26].

The originality of this article is therefore to observe sustainable tourism through the daily practices adopted by holidaymakers. The approach of this article is to consider holidays as a period delimited in

time in order to compare (un)sustainable practices adopted on holidays with those of everyday life in two areas: mobility and food. Since the focus is on tourists' practices, this article may be of interest to tourism professionals so that they could better understand their customers' levers and barriers about maintaining sustainable practices even while they travel.

To this end, this paper adopts an innovative theoretical framework based on theories of social practices. Data are collected through twenty in-depth interviews with young adults (25–35 years old) from all of the French-speaking provinces of Belgium. These interviews were crossed with those of some parents of these young adults in order to reinforce the quality and veracity of the information obtained. After a theoretical framing on sustainable consumption, tourism, and practices, the presentation of results is divided into two distinct parts: the first answers the titular question by a descriptive comparison between the practices of daily life and those adopted during holidays, and the second attempts to identify some avenues for better highlighting some distinct dimensions of these practices.

2. Theoretical Framework

The theoretical part of this article focuses successively on sustainable consumption, tourism, and social practices. Each term will be defined and the position of this article in relation to each topic is explained.

2.1. Sustainable Consumption

In June 1992, the Earth Summit took place in Rio de Janeiro. In line with the Brundtland Report published in 1987 [27], 179 head of states took the decision to address sustainable development issues. It is on this occasion that the terminology "sustainable consumption" appears for the first time on the international political agenda [28,29]. In 1994, at a round table during the Oslo Symposium on Sustainable Consumption, the Norwegian Ministry of the Environment proposes this working definition of sustainable consumption and production: "The use of services and related products, which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life cycle of the service or product so as not to jeopardise the needs of future generations" [30].

While this definition is regularly criticized (in particular because it combines the concepts of sustainable production and sustainable consumption in the same definition), it must be noted that no other definition has so far been unanimously accepted. Moreover, other criticisms, including those of Latouche [31,32], also highlight the fact that "consumption that is called critical, responsible, or ethical and Fair Trade can appear to be oxymorons on a par with sustainable development. The need to free ourselves from consumerism is as great as, if not greater than, that of putting an end to developmentism. Slogans such as 'consume ethically' and consumption in a 'de-growth' perspective 'buy fair' are contradictory and perverse, for they conserve the core problem, i.e., the consumption imperative" [32] (p. 181).

While it is difficult if at all possible to define what sustainable development is, it is equally complicated to define what sustainable practices are. Indeed, outlining the exhaustive limits of what exactly a "green" practice is a complex exercise that has not yet been achieved in the current literature. The core of the problem is that defining the "sustainability" feature is a combination of environmental, technological, social, ethical, and philosophical dimensions that are difficult to delimit. As an example, taking the train to go to work could be considered a sustainable practice. Nevertheless, taking the train implies favoring nuclear energy over fossil energy (at least in Belgium), which may be questionable given the risks (environmental and human) associated with nuclear power plants. On the other hand, taking the train is considered a "green" practice, especially if it replaces the car because it limits global warming. However, is it still a "green" practice if the bike is abandoned in favor of the train?

In the context of this article, “green” practices are what is commonly accepted as such by public opinion (e.g., using public transport, reducing daily meat consumption) without implying that “green” practice refers to a necessary environmental motivation behind the practice [33].

2.2. Tourism and Sustainable Tourism

As in other Western societies [34,35], Belgian touristic demand has been growing every year since 1945. At the same time, deeper attention to sustainable tourism seem to be making a real breakthrough in the area over the last years. The United Nation World Tourism Organization (UNWTO) defines sustainable tourism as “tourism activities that can be maintained, or sustained, indefinitely in their social, economic, cultural and environmental contexts” [35] (p. 1). This concept has led to an impressive literature: the International Centre for Tourist Research and Studies (CIRET) [36] lists no less than 150,000 tourism-related items, including around 5000 dealing specifically with sustainable tourism.

According to Buckley [37], who conducted an extensive state-of-the-art review on the subject, studies on sustainable tourism issues are divided into two phases. The first appeared at the end of the 1980s and was mainly carried out by geographers. These works were based on the assumption that “sustainable development is inherently good and appropriate for tourism, and that its adoption will solve many of the negative problems that have resulted from the development of tourism” [17] (p. 8). The second period comes ten years later and is mainly based on the criticism of this concept [11–13,38,39].

In addition, many sociologists also draw attention to the fact that framing of sustainable tourism is also being taken over by social psychologists and social marketers who are developing theories that emphasize individual will and responsibility [34,40]. Hall [33] reviews different approaches to studying the adoption of sustainable holiday practices and concludes that: “without facing up to the implications of structure and institutions then the likelihood of tourism activities and behaviours being “locked-in” to particular unsustainable socio-technical systems of provision is greatly increased” [34] (p. 1103).

This article is part of this critical trend as it proposes to analyze sustainable tourism through the persistence or non-persistence of sustainable daily practices during the holidays.

2.3. Studying Sustainable Behaviours vs. Sustainable Practices

The popularization of the concept of sustainable development leads to various initiatives, declarations and watchwords [41], political and private companies decisions [42,43], and activist movements [44,45]. The main objective of these initiatives was to “expect consumers to exert a significant favourable influence [on the environment]” [41] (p. 1). Indeed, according to Shove and Spurling, “[i]n popular and policy discourses, it is usual to explain such changes as outcomes of individual choices” [46].

Moreover, in the academic sphere, social psychologists and economists took up the field of sustainable consumption [9] and mainly used the rational action paradigm [1,2] based on individuals and behaviours. These reflections lead to the creation of different “green” consumer behaviours [3,4,47] based on variables such as environmental values, education or personal motivations [48]. These psychosocial theories have two points in common: the unit of analysis is systematically the *individual* and the basic premise is that “moving towards a more sustainable society depends on helping *people* to make better *choice*” [46] (p. 1). From this point of view, the adoption of sustainable practice therefore depends only on an individual’s willingness to change. Sociologist E. Shove [8] ironically reinvests the ABC (Attitudes, Behaviour, Context) model developed by P. Stern by changing the “Context” by “Choices.” She explains that the intervention strategies put in place for the adoption of sustainable behaviours are based on a presupposition that considers “that environmental damage is a consequence of individual action and that given better information or more appropriate incentives damaging individuals could choose to act more responsibly and could choose to adopt “pro-environmental behaviours” [8] (p. 1275).

Nevertheless, over the past two decades or so, consumption theories have experienced a “practice turn” [49] in the sense that “attention has turned from individual consumers to the cultural, material and economic structuring of consumption” [46] (p. 3). By shifting the focus from behaviours to practices, theories of social practices “provides some new insights into how consumption is organized and how it might best be analysed” [50] (p. 132).

2.4. Social Practices Theories

Following this line of thought, the theoretical framework of this article is based on the theories of social practices. This stream of thought was initially inspired by the philosophy of Wittgenstein, the sociology of Bourdieu, Giddens’ theory of structuration [51] but also by scientific concepts from the area of science and technology [52]. These theoretical frameworks do not constitute a corpus of homogeneous contributions but represent “a multiple theory that commonly adopts a conceptual position towards culturally oriented research” [53] (p. 638).

Concerning the definition of the practice, most authors of this theoretical stream agree on the two definitions given by Schatzki that define practice as a performance and as “a temporally unfolding and spatially dispersed nexus of doings and sayings” [14] (p. 89). For Schatzki, practice as performance refers to “the doing, the actual activity or energization, at the heart of action. (...) It designates the continuous happening at the core of human life, which is one of the most important features of the world” [14] (p. 90). To exist, a practice therefore must be performed, in other words, translated into concrete action. From the second definition of a practice, Schatzki lists various components that make up a practice: know-how and routines, institutionalized procedures and teleoaffective structures. Reckwitz [15] adds a fourth component, technologies and physical structures. The components are therefore constitutive of a practice.

A major characteristic of this framework is that the practice becomes the unit of social analysis. The objective of these theories is indeed to “put the practice in the foreground and therefore the individual in the background” [54] (p. 22). Therefore, it is no longer the individual who adopts a practice, but the practice itself that recruits the individual. The individual is also called “practitioner” [14] and is therefore the “carrier” of the practice in the sense that he constitutes “the unique crossing point of practices, of bodily-mental routines” [15] (p. 256). In this way, practices do not necessarily appear homogeneous, either among themselves nor among the different practice carriers. This line of thought will be applied empirically in the first section of the results below.

Warde [55] distinguishes two successive waves in social practices theories. The first generation lays the foundations of this framework and is invested by various theorists of the twentieth century (Bourdieu [56], Foucault, Giddens, de Certeau, ...). The initial objective of the first wave was to overcome the traditional dualism between structure (holist vision) and actor (individualistic vision) [50]. This willingness to reconcile the holistic view with the individualist is originally articulated by A. Giddens who states that “the basic domain of study of social science, according to the theory of structuration, is neither the experience of individual actor, nor the existence of any form of societal totality, but social practices ordered across space and time” [57] (p. 2).

The second generation aims to test and deepen the theoretical concepts established by the first wave of theorists. Therefore, they have aimed to abandon a static vision of the practice that would manifest in an individual, either passive and undergoing structural dictates, or totally self-determined. To do this, they focus on the practices as such and consider that they are “structured and organized through three dimensions: practical understanding; explicit rules; and teleoaffectivity” [58] (p. 300). These different dimensions inspire the analysis of the second part of the results’ section.

3. Data and Methods

The following presentation is based on Tong’s article of [59] that provides a set of 32 items to be explained how reporting on a qualitative research. Data were collected in Belgium as explained below.

3.1. Data

The qualitative method used in this research is the in-depth interview, defined by Boyce and Neale as a “qualitative research technique that involves conducting intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program, or situation” [60]. My objective was to obtain a narrative of practices in the sense of Bertaux [61], that is to say a set of in-depth and meticulous descriptions of personal experiences as far back the interviewees could remember.

The topics of these interviews include the following: practices related to food, to shopping for grocery and clothes, as well as practices related to mobility. The ‘history’ of these practices was searched for by the researcher with each participant.

This research includes 36 in-depth interviews: 20 in-depth interviews with young adults reinforced by 16 in-depth interviews with some of their parents. In this article, only the practices of young adults will be studied, but all the interviews will be considered. These cross-interviews on two generations [62,63] as well as between siblings are interesting because they solidify the quality of the data collected individually while providing key information for understanding family dynamics and the construction and evolution of consumption practices. I conducted the face-to-face interviews from September to November 2018 in all the provinces of French-speaking Belgium. I always met the interviewees at their home.

I interviewed 22 young adults, of whom 20 went on holiday during the last year and are therefore included in this study. All the young adults interviewed are between 24 and 36 years old and were born between 1982 and 1994. These generations are very relevant because they were born with the issues of sustainable development and environmental protection. This age group is also one experiencing many changes: entering the labour market, leaving their parents’ home, having children, and so forth. The situations specific to this period of life can also encourage or hinder the adoption of practices with a lower impact on the environment. Indeed, it is during this transition period that young adults adopt their first real consumption practices. For example, how and with what to fill the fridge? Where to go for groceries? How to get there? Which products to buy? Where and how to go on holiday? How to get around on a daily basis? As long as they live with their parents, they are always dependent on them.

The young adults have been selected on three common characteristics: they have all left their parents’ family home; they have all adopted in their daily lives at least one practice presumed to have a lower impact on the environment; they all have at least one parent who was available for an interview. Among these young adults, three are only children, three are couples, and in two cases both of two siblings were interviewed. They are also young people with a relatively high socioeconomic level and belonging to the upper-middle social class. Twenty out of 22 have a higher degree (POA or Master’s degree). It can therefore be assumed that financial resources are rather homogenous within the sample. Sociodemographic data of the young adults are provided in the Appendix A (Table A1). To preserve anonymity, all first names have been changed.

The interviewees were recruited from different channels: by sending emails to managers of local transition initiatives linked with sustainable consumption (such as groups buying local, organic and seasonal food products; Repair Cafés; etc.) and by attending events about sustainable practices (such as conferences on zero waste or vegetarianism). The particularity of the presentation of the research to the respondents is to be highlighted, as the initial topic announced did not mention reflexion on the sustainability dimension of the practice. Respondents were told that the work focused on the transmission of habits across generations. The aim of this approach was to try to avoid social desirability bias [64] that would encourage a consciously or unconsciously “greening” of practices by respondents.

Regarding interviews with parents, the recruitment process is obviously different. I asked for their contact information once I had finished the interview with the young adults. The interview with the parents usually took place a few weeks after their children’s interview. Even if the topics remained

the same, the interview grids were enriched on a case-by-case basis according to the interviews of their children previously recorded. For example, if a young adult had related an interesting situation to me, I would be careful to have his/her parent(s) tell it to me as well. This allowed me to clarify some of the data but also to obtain a reinforcement and a new perspective on the data already collected.

The analysis below focuses on mobility and food practices compared in two different periods: in everyday life and during the holidays. Concerning holidays, only leisure tourism was considered. In other words, business travel was systematically excluded from the data used in this contribution. In addition, only stays of three nights or more were taken into consideration. The interests concerning daily living practices were similar to those during the holiday period. The objective was to obtain the most detailed description for each practice studied.

3.2. Method

All interviews were recorded before being entirely transcribed and custom-coded using the qualitative analysis software NVivo. The coding made it possible to obtain cross-tabulated information between the different practices (related to food and mobility), the different age groups (young adults and their parents) and the different periods analysed (daily life and holidays).

Using Kaufmann's approach [64], an in-depth vertical analysis was carried out for each interview in order to prepare to trace the career of each practice described by the young adults. The parents' interview reinforced the data previously collected by providing new insights into certain situations. This first step was followed by an overall horizontal analysis that revealed some recurrences and other trends that are explained in the Results section of this article just below.

Without claiming that these results may be exhaustive in any way (due to the number of observations and the limited number of the participants), the data collected by the in-depth interviews and consolidated by the cross-interviews provide numerous information that is to be processed. The results presented below are based on two ways of processing the data from these in-depth interviews: first, a more quantitative-oriented approach to observe certain interesting trends regarding mobility practices, second, content analyses to describe in detail food and grocery practices.

4. Results

The first section compares daily living practices in the categories of mobility and food with those adopted during holidays in order to see whether sustainable daily practices persist during the holidays. From these results, the second section analyses each component of the practice in order to highlight its impact on the adoption of sustainable practices.

4.1. Which Holiday Destination and Which Mean of Transport?

Out of the 22 young adults, 20 went on holidays during the last year. The destinations were the following ones: Belgium for one out of the twenty, France for eight, other Europeans countries (Denmark, Norway, Italy, The Netherlands and Spain for two of them [who are not in a relationship together]) for six others and non-European countries for the last five (Malaysia, Columbia, Indonesia and Costa Rica for two of them [who are in a relationship together]) (Table 1).

Table 1. Means of transport used in relation to the holiday destination.

	Belgium	France	Other Europ. Countries	Non-Europ. Countries	Total
Plane	0	1	5	4	10
Car	1	7	0	0	8
Carpooling	0	1	0	0	1
Hitchhiking	0	0	1	0	1
Total	1	9	6	4	20

Source: In-depth interviews conducted with 20 young adults who left on holidays (2017–2018).

Regarding the means of transport to reach their destination, ten took a plane: four to reach a non-European destination, five to reach a European country other than France, and one to reach France. The other ten used a car: mainly to go to France (this is the case for eight of them, including one who carpooled with friends), one to go to the Belgian coast and one who hitchhiked to Denmark. These trends corroborate those observed by Eurostat [65] the official European statistics website: France is the favourite tourist destination of Belgians and flying is the most popular for stays of more than four nights.

Table 2 allows having a look at the daily mode of transportation (rows) in relation to the mode of transportation adopted to travel to the holiday destination (columns). As for the nine adults who use a car as a main daily means of transportation, six of them flew: three of them to a non-European destination and three of them to a European destination (one of whom was flying to France). The other three took a car, one of which was a carpool.

Table 2. Daily transport (rows) vs. transport to reach the vacation destination (columns).

	Plane	Car	Carpooling	Hitchhiking	Total
Public transport	3	6	0	1	10
Car	6	2	1	0	9
Bicycle	1	0	0	0	1
Total	10	8	1	1	20

Source: In-depth interviews conducted with 20 young adults who left on holidays (2017–2018).

Out of the 11 people who use public transport on a daily basis, 10 went on holiday. Three took the plane (two of them to a non-European destination while the remaining one went to Spain), and six others took a car to go to France, the Netherlands, or stay in Belgium.

These results are interesting in the sense that it appears there is no apparent persistence (or continuity) between daily practice and the mode of reaching the holiday destination. Moreover, it seems that the means of transport adopted to reach the holiday destination is, in most cases, “less sustainable” than the transport used on a daily basis. Indeed, six out of nine daily drivers flew, while six out of ten daily users of public transport mainly used a car for their travel.

4.2. On-Site Mobility: By Car

Regarding holiday mobility, once on-site, there is an obvious heterogeneity between the observed practices. First, everything depends on the means of transport used to get there (Table 3). Indeed, generally those who have travelled by car continue to use it during their stay. Only one exemption is observed: a woman traded her car for a bike once at her holiday spot (she went to the Netherlands).

Table 3. Transport to reach the holiday destination (rows) vs. transport on-site (columns).

	Public transport	Car	Carpooling	Bicycle	Foot	Total
Plane	6	3	0	0	1	10
Car	0	7	0	1	0	8
Carpooling	0	0	1	0	0	1
Hitchhiking	1	0	0	0	0	1
Total	7	10	1	1	1	20

Source: In-depth interviews conducted with 20 young adults who left on holidays (2017–2018).

For those who arrived by plane, mobility at the holiday destination is performed either by car rental or by use of public transport. Of those who opted for public transport once they landed, half do not have a driving license, therefore excluding use of the car. Those who went on holidays in non-European countries rent a car more easily.

Finally, Table 4 compares the daily means of transport (rows) with those used at holiday sites (columns). Car use represents half of the answers. Out of the nine who use a car as their main means

of transport on a daily basis, five also adopt it to travel on holiday. Out of the ten who use public transport on a daily basis, half also opted for a car. Nevertheless, this comparison presents the highest homogeneity in the persistence of daily practices during the holidays: most people who drive a car daily also use a car for mobility once at their holiday destination.

Table 4. Daily mobility (rows) vs. holiday mobility (columns).

	Public transport	Car	Bicycle	Carpooling	Foot	Total
Public transport	4	5	0	1	0	10
Car	2	5	1	0	1	9
Bicycle	1	0	0	0	0	1
Total	7	10	1	1	1	20

Source: In-depth interviews conducted with 20 young adults who left on holidays (2017–2018).

These comparisons between home-based and tourism-based practices do not pretend to be exhaustive but draw attention to certain main trends. It can therefore be seen that with regard to mobility, the adoption of sustainable holiday practices takes place in a heterogeneous way, without necessarily corresponding to the sustainable practices adopted in daily life.

4.3. Eating and Grocery Shopping

Concerning the comparison between food in everyday life and food on holiday, four aspects evoked during the interviews are analysed: whether or not to follow a vegetarian diet, whether to eat local products, whether or not to eat organic products, whether to source or not bulk products.

Of the 20 young adults studied here, five are vegetarians in daily life, of whom three said they had eaten meat and/or fish during their holiday: *“Well, when we’re on vacation with our parents, we eat a little organic and fair trade fish. We’re taking it upon ourselves. You see, I think you have to stay grounded in your own family”*. (Madeleine, F., 26-year-old, in couple without children, public transport user and vegetarian in daily life). Sometimes, the acknowledgment does not come from the person concerned but from his or her relatives as Clara about her partner: *“Actually, my boyfriend doesn’t eat meat at home, but he could eat meat when he goes out, or on vacation... for example if we go once to a restaurant. On vacation, let’s just say it happens a little more often”* (Clara, F., 25-year-old, without children, car driver and vegetarian) or Lise (F., 51-year-old) about her daughter and her son-in-law: *“Yes, they had started by avoiding meat and fish but in fact, on holidays, they could eat some fish...even chicken.”* These first quotes already provide an insight into the role of relatives in the persistence of sustainable daily practices during holidays.

Seven young adults (including one vegetarian) reported that they use bulk supplies in their daily lives. However, only one mentioned it when it came to holiday food. Not mentioning bulk does not mean that no one buys bulk during the holidays. Nevertheless, this marks a difference between daily consumption where bulk is mentioned spontaneously and holiday food where almost no one refers to it. In addition, the only time bulk products are discussed during the holidays is to show how difficult this practice is.

“I’m trying to buy only bulk and not go to the supermarket anymore! But for example, when you go on a hike, I have to make a compromise. When we’re on a hike, we’re trying to lighten up so I bought soup bags in a supermarket. And while I was there, I bought some pasta... It is still local pasta but it is plastic wrapped. Then I also bought chocolate, because bulk chocolate is really very expensive... It’s the same for dried fruit: it’s single or double [the price]! When I buy things for the group, I don’t dare to buy everything in bulk.” (Lola, F., 30-year-old, in couple, without child, bulk consumer in daily life).

This quotation highlights again that sustainable practices of daily life are not especially transferred during holidays. But this quote also shows the influence of relatives and of friends in adopting practices and the compromises that must be made.

Concerning the other two criteria (local food and organic food), the analysis proved to be more complicated because these are assimilated as systematically linked for some respondents; however, these links are not necessarily valid. As a result, most of the interviews focus on local food on holiday but few address the organic characteristic of their food. Jean-Baptiste's quotation clearly shows that conflation is quickly achieved: *"At home, we eat only local and organic food. So, on holidays, food is basically the same as what we do here. We go grocery shopping, we eat local, we try to find local products."* (Jean-Baptiste, M., local and organic food consumer in daily life). Finally, when the discussion came to local and organic food, it was essentially to demonstrate the complexity of getting it on holiday as Liliane says, *"It is true that on a daily basis, eating organic food is one of my priorities. On the other hand, on holiday, clearly I am less attentive.... Actually, I don't know all the available options and I'm going to keep it simple"* (Liliane, F., 32-year-old, local and organic food consumer in daily life).

Another recurrent conflation was to confuse locally produced food and local food specialities as Alix does: *"I eat local food home and away. For example, in Asian countries, I eat the typical dish. I'm not going to a French restaurant while I'm in India. I prefer to eat local!"* (Alix, F., 26-year-old, became vegetarian after her three-month trip in Malaysia). There is no guarantee that the typical dish will be cooked with local products but Alix seems to think so.

Concerning food, it is clear once again that the adoption of more sustainable practices during holidays does not take place in the same way as in everyday life. Here too, it seems difficult to observe recurrences or homogeneity across the various interviews, but it must be noted that more of the sustainable practices adopted in everyday life are not systematically transferred to holidays. Except for daily mobility versus holiday on-site mobility, there is little consistency between sustainable practices during periods of tourism versus everyday.

4.4. Understanding Compartmentalisation Through the Lenses of Social Practice Theories

Based on the three components of practice defined by Schatzki [14] as well as the one added by Reckwitz [15], this second part of the article attempts to better understand the reasons for variations observed between the adoption of sustainable practices in daily life and on holidays. This section provides an opportunity to empirically apply the conceptual framework of social practices theories by starting once again from the practices related to the means of transport used to reach the holiday destination, to mobility on-site, and then to eating and grocery shopping. The last subsection highlights some dimensions that are not yet (or very seldom) taken into account by these theories.

4.4.1. Material Structures: Planning a Trip without Leaving One's Sofa

Today, a set of material arrangements (such as low-cost airlines, online accommodation booking platforms, travel agencies, etc.) allow planning for tailor-made, fast and cheap holidays. These new structures correspond to material structures and are defined as "objects, infrastructures, tools, hardware and the body itself" [66]. Material structures are essential to the realization of any practice since they are the concrete "equipment" necessary for the realization of the practice. This quote of Nathan clearly illustrates this dimension:

"I wanted to go to Spain and I was really sick of everything, so I booked it in two minutes: fast and efficient from my couch. I packed my backpack, took a plane and found myself in northern Spain without really knowing where I was going." (Nathan, M., 32-year-old, vegetarian and car-driver in daily life)

Indeed, it is nowadays possible to plan a trip without leaving one's sofa. Regularly, new material structures appear (e.g., the Airbnb platform, which now allows renting a room or entire accommodation in any city of the world) to facilitate tourism. These material structures obviously encourage going on holidays, making the various planning and booking processes much more accessible and further, encouraging destinations beyond the country's borders.

Sustainable tourism is no exception. Nevertheless, even if sustainable tourism offers an increasingly developing, it is still not enough to allow systematically the adoption of practices with a lower impact on the environment. Indeed, sustainable alternatives are sometimes lacking or are too expensive, impeding the adoption of sustainable practice during holidays as Caroline explains *“If I had more money, I would go on holiday by train rather than by plane, I think! But flying is easy, it’s cheap. When I’ll be rich and famous, I’ll take the train!”* (Caroline, F., 28-year-old, cyclist in daily life). These material structures can also be mobilized to justify the non-adoption of sustainable practice, as is the case in the two quotations above. Michel uses the lack of material structures as an excuse. He considers that material structures do not allow him to travel in any other way: *“We do not like all-inclusive hotels, but sometimes we have no choice but to go there”* (Michel, M., 35-year-old, car-driver and vegetarian in daily life). According to him, he is “forced” to adopt an unsustainable practice because of the limited offers. This contradicts the ABC psychology model and is therefore in line with Shove’s approach [8] who demonstrates that the adoption of sustainable practices is not only a matter of personal willingness to change. Nevertheless, it seems that the desire to go on vacation outweighs ecological considerations. At no time does Michel question going on holiday. This observation also corroborates [10] who says that people who are aware about the impact of their practices on the environment are “not actually willing to reduce their flying habits significantly” (p. 480).

Therefore, it can be concluded that the lack of a sustainable material structure does not prevent people from going on holiday, even for environmentally sensitive individuals. If a sustainable option can be found among the material structures, so much the better for them, if not, never mind.

4.4.2. A Matter of Habit

Out of these 22 young adults, 20 said they went on holidays annually when they lived with their parents. Therefore, all the stories of practices report annual holidays, and this as far back as they can go back in the narration. Indeed, when the question of holidays during childhood is asked, all informants could describe certain family routines, such as Alix Luc and Aude.

“During the family holidays ... We never went to a hotel, it was always camping. It was in Spain or in South of France. We went once to Turkey, to the hotel. This is the year my dad sold some land, so we had a little more money (she laughs). But it has never been a luxury vacation.” (Alix, F., 26-year-old, vegetarian, public transport user in daily life, went to Malaysia last year).

“With my parents, it was always the North Sea ... because my mother is extremely scared of the plane. I think she does not like the train too much, nor the boat ... (. . .). And then, we went 2–3 weeks a year to the North Sea. I would say that we went maximum three times elsewhere, that is to say: in France.” (Lucas, M., 29-year-old, vegetarian, car-driver in daily life, went to the North Sea last year).

“Every year, since I was as young as I remember, we always went to the mountains with my parents during the summer. The tradition stopped last year as Coralie and I, and our boyfriends, are working, so it was difficult to coordinate everyone.” (Maud, F., 26-year-old, vegetarian, public transport user in daily life, went to France last year).

If the destinations are less exotic than those described previously (perhaps namely because all the tools facilitating accessibility for far away destinations did not exist and/or were much more expensive at the time), these quotes show the regularity that these young adults experienced in their childhood vacations: each year they left with their family during the summer. Once adults, they reclaim this practice (choosing nevertheless more exotic destinations) but continue the tradition. The routines adopted beginning in childhood continue to adulthood even if they are updated. It is therefore a deep anchoring and this observation testifies to the routine nature of a practice [14] while highlighting the difficulty in changing practices.

4.4.3. Teleoaffective Structures: Between Social Distinction and Guilt

Another of the main components of the practice is the teleoaffective structure that Schatzki [14] defines as “embracing ends, projects, tasks, purposes, beliefs, emotions and moods” (p. 89). The justifications given by young adults are part of teleoaffective structures. In a spirit of synthesis, only two dimensions are addressed in this section. The first one concerns the symbolic importance of holidays, especially concerning which holiday destinations and the means of transport used to get there. The second dimension deals with feelings of guilt about holidays. Why does going on holidays remain non-negotiable while the guilt of leaving is sometimes heavy to bear individually?

The two quotations below show indeed the existing societal standard for the holiday area. Indeed, Lucas clearly justify his type of vacation by implying that some are better than others:

“As I have more money, my life stabilizes; I make sexier trips ... Like Tuscany, Southern Spain, and South of France, places where I was not especially before ... and I also did City trips to Paris, London, and Amsterdam.” (Lucas, M., 28-year-old, vegetarian in daily life).

Mégane’s quote goes in the same direction when she explains this:

“I went for a month in Peru. The year after, I went to Nicaragua ... That’s the way it is: I like to go to the South, generally. But last year ... You know, with the opening of the store [hers], I could not make big follies. So we just went to the South of France with a caravan.” (Mégane, F., 27-year-old, public transport driver in daily life)

Here, Mégane’s quote is enlightening. While at the beginning of the interview, she explained how practical it was to travel in a caravan, she nevertheless admits later that this style of vacation is a default option because of a lack of financial resources. She also implied that if she had had the opportunity, she would have gone to another destination.

These quotes show the gradation between the different destinations and means of transport: travelling to the North Sea or the South of France by caravan does not mean the same thing as going to Peru or Nicaragua by plane. This may reflect the importance of holidays in the current social system and the role of holidays in identifying with a social class. That is what Crick says: “the world of tourism is rife with the class distinction in our everyday world” [67] (p. 334). In this sense, holidays could be seen as a form of ostentatious consumption in the sense of Veblen [68]. Moreover, the two young adults of the sample who did not go on holiday during the last year are two women who have a slightly lower socio-economic level compared to the rest of the sample. These reflections emphasize the importance of social classes according to the holiday style adopted.

While holidays are socially normalized [69] and routinized in the daily lives of the rather well-off young adults, some feel a strong sense of guilt. Indeed holidays can be seen as a parenthesis of pleasure often avoided in daily routines sometimes strict, but still a source of guilty for young adults who have internalized environmental issues. Nevertheless, it is also interesting to note that just because guilt is present individually, it does not mean that the practices that have the greatest impact on the environment cease as Aude’s testimony shows: “We know that flying is not good for environment, but we still do it: we need it too much!” (Aude, F., 35-year-old, practicing voluntary simplicity) or the quotes of Camille and Alix:

“I love spending Christmas in the mountains [that means at least 700 km away from her place] because I love the spirit that prevails there. But at the same time, I feel quite guilty because I succumb to a commercial trend... Lights, gifts, packaging, ice rink... I’m participating in a huge ecological disaster!” (Camille, F., 24-year-old, went to Norway by plane last summer)

“When you fly over Malaysia, you only see palm fields, and already you think it’s a problem. Then you land and you see the pollution of the sea and then you think about biodiversity, nature, animals. You see the streets filled with dirt, and garbage. I was just obsessing about it, and I felt so bad... I was

so shocked. And at the same time I felt responsible and helpless.” (Alix, F., 26-year-old, became vegetarian after her three-month trip in Malaysia).

Here, these quote show that responsibility is individualized, placed on the shoulders of each individual. This gives the impression that climate and environmental issues are a set of problems that can be solved personally rather than as a global problem beyond the individual level. These results corroborate Barr who explains that over the last 20–25 years, a fundamental shift has occurred in environmental issues: “policy has begun to shift from a ‘top-down’ approach to a ‘bottom-up’” one [70] (p. 51). As Barr explains it, initially ecological problems were discussed on a macro scale such as related to governments and major organisations. However “in recent years, there has been a growing emphasis on the role of individual consumers and their potential to mitigate against global, as well as local, environmental problems” [10] (p. 474).

Therefore, the adoption of a sustainable practice does not result solely from an individual’s desire for change. Good will is not enough to green everyday practices. Holidaymakers are aware of the impact of their practices on the environment, some even feel guilty, yet they continue to leave. These results corroborate Shove [69] saying that “the vast majority of environmentally significant consumption is not a matter of individual choice, green or otherwise. It is instead bound with, and constitutive of, irredeemably social practices governed by norms like respectability, appropriateness, competence and excellence” (p. 198).

4.4.4. “Thinking Globally, Acting Locally”: The Focus of Institutionalized Procedures on Individual Practices

The fourth component of a practice is institutionalized procedures which refer to “the structural properties involv[ing] elements of meaning and communication, control and power relations, and legitimacy” [71] (p. 2491). Some institutionalized procedures could also have an influence on whether or not sustainable practices are adopted during holidays. So, the non-taxation of kerosene by European countries and paid holidays just before summer holidays (in Belgium) are two elements of institutionalised procedures.

First, a leaked report commissioned by the European Commission finds that the European aviation sector is chronically undertaxed relative to other aviation markets and other means of transport. The report was completed last year. It has not yet been made public but has been distributed by the NGO Transport & Environment. The report focused on three different forms of taxation: a tax on the ticket purchased by the passenger, value added tax (VAT) on the same ticket, and the tax on kerosene which is used for jet fuel. For now, no European member country applies a tax on kerosene, while other countries such as the United States, Japan or Canada do (1 cent, 14 cents and 8 cents/litre, respectively). VAT was defined at 0% by an EU directive (2006/112/EC) but this did not prevent several countries from applying VAT, from 6% in Portugal to 25% in Croatia. By the way, seven Member States apply taxes on kerosene at an average of €11 per ticket. By comparison, Australia, Brazil or Mexico apply a tax on kerosene of around €30–40 per airline ticket [72]. Such state decisions are likely to influence whether or not practices with a lower environmental impact are adopted.

Moreover, people working full time in Belgium generally benefit from four week of holidays. During these holidays, employees continue to receive their salaries. In addition, between May and June, they receive a double holiday allowance based on their last working year [73]. This nest egg may probably be an additional incentive (or even a legitimization?) to take a vacation.

However, this information must be taken with some caution because none of the twenty interviewees mentioned these dimensions explicitly. The influence of material structures therefore seems to be the least empirically testable component of a practice. But this doesn’t diminish its possible impact of the adoption, transformation or abandonment of sustainable practices during holidays.

4.4.5. Holidays with Children and Partners: The Role of the Relatives

This last topic is rarely mentioned in research using social practices theories. Indeed, Bartiaux and Reátegui Salmón [26] claim that “these theories do not provide an explicit place [for] social interactions” (p. 206). Beyond these two authors, no others using this theoretical framework seem to consider that the carrier of a practice is intertwined in a family and social fabric. In this sense, this section argues that relatives also play a role in the recruiting or not of practices with a lower impact on the environment as compromises must be made with the different family members.

First, all the young adults with children interviewed went on holiday last year. Nevertheless, having or not child(ren) seems to be one of the factors determining the destination and the means of transport. Indeed, among the eight young adults who went to France, five are parents with children aged 4 or younger. The only parents who did not go to France went to Costa Rica but their children are older (6 and 8 years old).

Among these five parents who went to France, three claimed to have chosen France because of their young children. They explained that their previous trips (before the birth of the children) were more exotic but that they had recently went for France for practical reasons.

“Before being in my thirties, I travelled a lot. It was something that really meant a lot to me. I went to Finland, Australia, India, the Reunion Island, and I regularly did city-trips. Then I settled down, we had a baby and we’re becoming more reasonable.” (Elodie, F., 34-year-old, mother of a 15-month-old baby)

“We did Cuba, Namibia, Australia, Indonesia, Laos, and Thailand... And we did one or two city-trips per year: Stockholm, Berlin, Prague, Lisbon, Porto... Now, for the past two years, we’ve changed our habits because of the little chip...We are going much closer. This year, it was exclusively France.” (Louise, F., 32-year-old, mother of a 14-month-old baby)

“And then I got a taste for holidays in the South and everything... But this year, since we have the baby and he’s a little annoying, and he doesn’t sleep through the night, etc., we went to the North Sea [in Belgium]!” (Lucas, M., 28-year-old, father of a 2-year-old baby).

So, having children or not seems to be a key factor concerning the holiday destination. Indeed, while young parents in this sample have always travelled and continue to do so once they have children, their destinations are changing according to their new constraints. Having children can also determine the means of transport to reach the destination and/or to move on-site.

“It’s much easier to go by car and stay by car with the little one. We thought we were going to go back to the sun, but when you do the counting, the plane with the stroller, the bags, the stuff, arriving with nothing, renting a car... Forget about it. Forget about it. It’s not a vacation anymore, is it?” (Etienne, M., 29-year-old, father of a 14-month-old baby)

In the same way, some young adults reported that they take advantage of being childless to make long trips as Michelle: *“I like to go far away. My starting-point is that as long as you do not have children, you have to take advantage of it.”* (Michelle, F., 27-year-old, in couple without children). However, Michelle’s case show compromises. Indeed, since she met her partner, she has changed her on-site mobility during her holidays.

“But it’s true that I love going far away, discovering a new language, a new culture, different food, feeling a little globe-trotting in my soul, with my backpack, having to take the bus... or whatever. Well, when I started dating [name of her partner], we found compromises because he wasn’t into taking the bus. So, instead of taking the bus, we rent cars.” (Michelle, F., 27-year-old, in couple without children and car driver in daily life).

As pointed by Hall [34] “people do not act as isolated individuals” (p. 1099). These observations highlight a limitation of social practice theories: that they take too little into account the role of relatives in the adoption, transformation, persistence or abandonment of sustainable practices. However, these relatives, whether children or companions, seem to have a significant influence on the destination or modes of travel, as the above quotes show. Only the fact of going on holiday does not seem to be questioned by relatives.

5. Conclusions

On methodological grounds, while the data used in this article cannot claim either saturation of results or exhaustiveness because of the small number of interviewees, the 20 in-depth interviews conducted with young adults and consolidated through eighteen cross-interviews with some of their relatives provide interesting and sufficiently well-founded trends. Indeed, the richness of these in-depth interviews allows empirically applying the conceptual framework of social practices theories with precision in order to understand the importance of each practice component in the persistence or lack of persistence of sustainable practices during the holidays. In addition, crossing these first interviews with those of their parents, partners and/or siblings strongly consolidates the data by qualifying them, a richness that would never have been obtained without this method.

The first part of the results demonstrates a form of heterogeneity both in the adoption of sustainable practices in daily life as well as in their persistence during the holidays. Indeed, in everyday life, those who are vegetarians are not especially those who do not use the car as their main means of transport, while commuters are not necessarily attentive to the organic and local quality of their food. In addition, the results showed that the sustainable practices adopted on a daily basis did not persist especially during the holidays: some daily public transport users took the car to reach their holiday destination while some vegetarians ate meat during holidays.

These observations can be related to the concept of “compartmentalisation” defined by Halkier [74]. Based on Iversen’s work [75], Halkier defines compartmentalisation as the way in which “reflected and chosen consumption practices can become ‘crowded out’ by tangible routinization” [74] (p. 39). This concept is then reinvested by Bartiaux [76] and Bartiaux and Reategui Salmón [33] to express the idea that certain “green” practices can be adopted in some areas of consumption (e.g., food) and not in others (e.g., mobility). They explain that “eclecticism seems to be the norm and that ‘green’ considerations, if any, do not transmigrate among all practices” [33] (p. 476).

This contribution makes it possible to deepen this concept via a distinction between different forms of compartmentalisation: inter-thematic compartmentalisation, intra-thematic compartmentalisation and periodic compartmentalisation. The inter-thematic compartmentalisation is the adoption of “green” practices in some but not all consumption areas. Indeed, compartmentalisation occurs from one routine to another: sometimes the “green” focus is placed on food, sometimes on mobility but no regularity can be observed within the different consumption routines whose combination appears to be unique. An illustration of this inter-compartmentalisation is that among the young adults interviewed, some are attentive to eating organic, local and seasonal products but drive more than 100 km per day alone in their car.

The second type of compartmentalisation that I have observed is between two practices belonging to the same area of consumption. The adoption of eco-consumption practices is therefore not done in a homogeneous way, even within the same area. On the contrary, sustainable practices appear in a dispersed way within the same area of consumption. An example of intra-compartmentalisation is to fly to a rather close holiday destination (let’s say a few hundred kilometres) and then use public transport once on-site.

Finally, I call a third form of observed compartmentalisation as “periodic”. This form of compartmentalisation takes place only at certain times or during certain events. Here, the idea is that certain periods or certain events (a party with friends, Christmas, or holidays...) engender

compartmentalisation. All the discrepancies between more sustainable practices of daily life and those of holidays are typical examples of periodic compartmentalisation.

These three types of compartmentalisation make it possible to answer the first question of this article: very few sustainable daily practices persist during the holidays. These observations can be characterized as periodic compartmentalisation in the sense that “green” practices are put in brackets for a specific period of time. However, at least one interviewee was enrolled in a vegetarian food practice during *and* after her long stay in Malaysia, even though she was not previously a vegetarian.

The second part of this contribution used an empirical application of the different components of practice developed by Schatzki [14] and Reckwitz [15] to show that the non-adoption (and even the non-persistence) of sustainable practices does not result from an oversight, or a lack of will or determination of practitioners. These sections showed the need to take into account the different dimensions allowing the adoption of a “greener” practice underlining the importance of each component of the practice. Indeed, material structures, routines, teleoaffective structures, and institutional dimensions must be considered as a whole constituting the practice, each component playing a role in the persistence, the transformation or the abandonment of sustainable practices. All of these components are required for the practice to take place. In this sense, the use of theories of social practices to study sustainable tourism through daily practices has proved to be relevant: the importance of each of the four components of the practice has been empirically demonstrated for understanding the adoption, persistence, or abandonment of sustainable practices.

Nevertheless, the last subsection has also shown one of the limitations of current theories of social practices. Indeed, it was observed that relatives also have an impact in the persistence or in the abandonment of practices. The section devoted to relatives highlighted that compromises and negotiations have to be made concerning whether the destination, the mode of transport or the food. This dimension remains insufficiently considered in theories of social practices (except in the work of Bartiaux and Reátegui Salmón).

Obviously, these initial reflections open up new avenues for reflection. From a theoretical point of view, a general reflection on the development of a definition of sustainable practice would be an important step forward in the field. On the other hand, future lines of research are also emerging, in particular by completely reversing the research question: are some more sustainable practices adopted during holidays? And if so, do they persist on a daily basis? In the light of the results relating to periodic compartmentalization, how can we envisage the career of practice? To what extent can it be fragmented? Are there other situations where sustainable practices are put in brackets?

Finally, this article has demonstrated that sustainable tourism is not limited to the material structures and other offers proposed by tourism professionals. On the contrary, sustainable tourism is also embodied in everyday practices: eating, travelling, grocery shopping, etc. However, these dimensions remain under-exploited in the area of sustainable tourism and the ambition of this article was to underline the relevance of deepening these questions especially since it was shown that some sustainable daily practices did not persist during the holidays. Sustainable tourism therefore concerns everybody—travel professionals, policy makers, consumers, governments, etc.—and it is played out at all levels. To encourage it, no component and no contributor should be omitted.

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Appendix A

Table A1. Sociodemographic data for the 20 young adults in the sample.

	Male	Female
In couple	6	12
With children	4	4
Master's degree	4	9
PAO	3	4
Semi-rural environment	3	7
Urban environment	4	6
Brother/sister in the sample	2	2
Partner in the sample	4	4
Total	7	13

Source: In-depth interviews conducted with 20 young adults who left on holidays (2017–2018).

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