AgBioForum, 26(3): 106-118. ©2024 **AgBioForum**

The Effect of Host-guest Interaction on Guests' Pro-Ecological Behaviour in Rural-based B&B Tourism: A Chained Multiple Intermediary Models

Siyang Wang
Ph.D candidate, College of Graduate Studies, Walailak University, 222 Thaiburi, Thasala, Nakhon Si Thammarat, 80160, Thailand, Lecturer,Guangxi Normal University, Guilin, Guangxi, 541000, China.
ORCID iD: https://orcid.org/0009-0009-8266-1884
Email: emiliedida666@126.com

Onanong Cheablam*
Associate Professor, School of Management, Walailak University, 222 Thaiburi, Thasala, Nakhon Si Thammarat, 80160, Thailand.
ORCID iD: https://orcid.org/0000-0002-6090-6141
Email: conanong64@gmail.com

This study explores the influence of Host-guest interactions on visitors' pro-ecological behaviours within the context of rural bed and breakfast (B&B) tourism. The research further examines how visitors' perceptions of value and their commitment to a location mediate this relationship. The subjects of the study were individuals staying at B&Bs in the Yangshuo cluster of China. A total of 401 data points collected through a questionnaire were analysed using Amos. The results indicated that Host-guest interaction had a significant effect on visitors' perceived value, which subsequently enhanced their attachment to the location. The study also revealed that these interactions indirectly fostered pro-ecological behaviours among visitors through the development of a sense of value and loyalty to the property. While few studies have sought to connect the practices of Host-guest interactions at B&Bs with the environmentally conscious actions of visitors, this research contributes to this area. It opens new avenues for investigating the critical role of interaction behaviours in improving the surrounding environment. The findings may assist management in addressing the growing ecological concerns in popular tourist destinations by creating an atmosphere that encourages guests to engage in environmentally responsible activities.

Keywords: Host-guest Interaction, Perceived Value, Rural-based B&B Tourism, Place Attachment, Pro-Ecological Behaviour.

Introduction

Ecological protection and commitment are central to global discussions, with guest behaviour being a critical factor influencing the ecological environment of tourist destinations. Inappropriate guest behaviours pose significant challenges to the sustainable development of these locations. Therefore, fostering and guiding pro-ecological behaviours among guests in sustainable tourism settings has become an urgent and essential issue for the tourism industry to address. Promoting guests' awareness of pro-ecological actions and encouraging them to preserve the ecological environment can support the environmental development of the leisure industry while reducing the costs associated with ecological governance (Gomes & Lopes, 2023).

Guests' pro-ecological behaviours in unfamiliar environments often encounter challenges such as data asymmetry and dysfunctionality, with externally imposed policies and regulations proving ineffective in reducing inappropriate ecological behaviours. In contrast, strong emotional motivations can overcome the limitations of situational factors, leading to positive behavioural spillovers. People with high ecological attachment are more likely to engage in pro-ecological actions across various environments. As a result, there has been growing interest in studying guests' pro-ecological behaviours from an emotional perspective. Research frameworks have expanded to encompass place attachment, subjective well-being, natural empathy, and psychological distance, with findings suggesting that guests' pro-ecological behaviours are more stable, proactive, and sustainable when driven by emotional management (Yu, 2017).

In addition to passively responding to ecological circumstances, individuals actively engage with ecological issues. Interactions between individuals from diverse cultural backgrounds can help break down preconceptions and foster greater appreciation, understanding, and respect for the guest destination (Kirillova, Lehto, & Cai, 2015). However, some scholars argue that visitors' negative impressions and behaviours toward a destination may arise from culture shock resulting from the Host-guest relationship (Goeldner & Ritchie, 2008). The relationship between Host-guest interactions and visitors' behaviours is influenced by numerous factors and perspectives, making it difficult to define consistently. Therefore, it is more comprehensive to examine the generation of pro-ecological behaviours from the perspectives of individual cognition, emotion, and social interaction. This approach allows for a more holistic understanding of the active driving mechanisms behind such behaviours.

B&Bs originated in the UK and expanded globally, particularly in the US, France, Japan, and other countries. In China, Rural-based B&Bs evolved from Nongjiale, family-run hotels, and inns to boutique establishments. These B&Bs now function as tourism and vacation destinations, offering high-quality accommodations shared between hosts and guests. Through the "B&B+" model, they integrate agricultural experiences, local expertise, and cultural engagement, fostering harmonious human-nature interactions and co-creative value. This short-distance vacation mode has gained popularity, enhancing guests' ecological perception and experience of green spaces (Fan et al., 2023). By addressing ecological issues through social interaction and activating the host's ecological wisdom, this model provides a win-win approach to ecological governance (Zhu, Wang, & Liu, 2021). However, there is a lack of research into how these

encounters influence visitors' pro-ecological behaviours. Meanwhile, transnational tourism research has focused on cultural exchanges between hosts and guests (Greer & Wagner, 2023), while studies in China mainly explore interactions between local residents and domestic guests within a shared cultural context (Wang, 2020). Previous research suggests that cultural differences and research backgrounds impact the relationship between pro-ecological experiences and behavioural intentions. Thus, studies on guests' pro-ecological behaviour in Rural-based B&B tourism in China may yield different findings compared to those in developed countries.

Place attachment, a fundamental concept in human-environment interactions, is a crucial psychological factor that reflects the "cognitive or emotional connection of an individual to a particular environment." One of its primary functions is to foster eco-consciousness and promote positive attitudes towards tourism destinations. However, empirical research on the relationship between place attachment and pro-ecological behaviours has yielded mixed results: some studies suggest that place attachment enhances pro-ecological behaviours, while others report the opposite or find no significant correlation at all. It is possible that the varying degrees of place attachment influence pro-ecological behaviours in distinct ways, which may explain these conflicting findings. Another factor contributing to these cultural disparities could be the use of different measurement tools in various cultural contexts (Daryanto & Song, 2021). Therefore, further studies are needed to explore the causes and functions of place attachment among B&B guests, particularly in urban settings.

The theoretical foundation for this discussion is the Stimulus-Organism-Response (S-O-R) model, which outlines the process through which an organism is exposed to external stimuli, undergoes mental processes, and subsequently exhibits behavioural responses. This model has become a key framework for studying guest behaviour and is widely applied in research on green consumption and the responsible ecological behaviour of visitors. Factors such as the mode of interaction, emotional intensity, degree of intimacy, and economic reciprocity act as external stimuli, influencing guests' evaluation of their perceptual encounters (Liu & Chang, 2020). The S-O-R theory explains this interaction process and provides a theoretical basis for understanding how individuals' subjective perceptions and evaluations of pro-ecological behaviours shape their actions.

Literature Review

Guest Pro-Ecological Behaviour

Eco-conscious travellers often use terms like "green consumption" and "ecologically friendly travel methods" to describe behaviours aimed at preserving natural ecosystems. Unlike the general public's everyday pro-environmental actions, tourists' behaviours are context-specific, focusing on respecting local culture, preserving the environment, and limiting human interference (Li et al., 2023a). This indicates that pro-ecological behaviours in tourism encompass both environmental and cultural aspects, offering a broader view of the destination's traditions. Research on pro-ecological behaviours has primarily centred on cognitive factors, such as attitudes, norms, and values, as well as theories like normative activation and planned behaviour, which explain how attitudes towards ecological protection form and predict individuals' behaviour. However, there has been limited research on the emotional and psychological dimensions of pro-environmental behaviour, particularly in tourism. In mobile tourism contexts, guests' emotions are more varied and dynamic, and ecological appeals alone are insufficient to alter behaviour. Emotional motivation can overcome contextual constraints and create positive spillovers, with individuals with high ecological attachment more likely to engage in pro-ecological actions across different environments (Yu, 2017). Additionally, the pro-ecological behaviours of vacationers are continuously influenced by social interactions with hosts and the destination itself. Contemporary studies, however, focus more on the impact of such interactions on guest satisfaction and loyalty within marketing contexts (Fan et al., 2023).

Host-guest Interaction and Pro-Ecological Behaviour of Guests

Host-guest interaction refers to the direct engagement between individuals from different cultural backgrounds. Munasinghe et al. (2022) define it as follows: "the Host-guest interaction will generate a certain response as long as the two parties have contact, perceive and understand the information conveyed between them, and give a certain response." This definition highlights the dynamic nature of Host-guest interaction in tourism, encompassing various forms beyond verbal communication. Recent studies have increasingly focused on the "effects of Host-guest interaction" on tourists' experiences. These findings support the notion that "Host-guest interaction" plays a significant role in shaping visitors' impressions of a place, which in turn influences their purchasing decisions and overall satisfaction. Furthermore, travellers may benefit from cultural differences by approaching them with an open mind, enriching their experiences while also fostering a stronger sense of shared humanity (Lehto, Davari, & Park, 2020).

Unlike traditional hotels, urban bed and breakfasts prioritise communication between guests and hosts. Bed and breakfast hosts not only observe their guests' behaviour but also actively guide it during their stay. They encourage guests to consume responsibly, take photos appropriately, and show respect for other cultures. Through subtle means, hosts influence guest behaviour and, when necessary, respond to misbehaviour with implicit boycotts. The incorporation of the host's ecological knowledge into their green practices has proven successful. As such, hosts play a central role in Host-guest interactions and can potentially curtail less respectful behaviours among visitors. According to Pu et al. (2023), Host-guest interactions foster positive relationships between hosts and guests, transcending the traditional

dynamic to co-create value in local sustainable tourism practices.

Mediating Effect of Perceived Value

Consumers form opinions on a product's perceived value after assessing its perceived benefits relative to its cost. Unlike more tangible metrics such as price and quality, value evaluation is abstract and subjective, varying with the consumer, culture, and time. The concept of tourists' perceptions of a destination's value emerged in the 1990s, focusing on their assessments of goods and services with an emphasis on "value for money." This perception extends beyond the actual value generated by the exchange of goods and services. Over time, the definition has evolved, shifting from a focus on "value for money" to a broader, more comprehensive evaluation (Sánchez et al., 2006).

Host-guest Interaction and Perceived Value

As a relational state, interpersonal interaction is fundamental to the tourism experience. Effective "Host-guest interaction" is considered crucial for guests to fully appreciate the value of their stay. Through interactions with B&B hosts, emotional energy flows, and hosts help fulfil guests' psychological needs. In turn, B&B hosts positively influence guests' perceptions of value through the products and services they offer (Ye et al., 2022). Prior to the trip, guests typically initiate contact with the B&B host via an information platform. The exchange of basic functional information initiates interactive communication, which reduces guests' risk perception and helps them evaluate the "value for money," facilitating the decision-making process. This interaction fosters emotional communication, easing guests' unfamiliarity during their travels, while high-quality interactions enhance the overall experience value for customers. During the stay, the Host-guest interaction, through activities such as welcoming ceremonies, product services, and problem-solving, fosters a familial and friendly atmosphere, evoking positive emotions in guests and alleviating feelings of constraint or awkwardness. Furthermore, the landscape design of the B&B, the local folklore, and the natural environment all contribute to enriching the guest experience, with the Host-guest interaction playing a central role in this process (Qian & Li, 2024).

Pro-Ecological Behaviour and Perceived Value

From a marketing perspective, behavioural loyalty, brand confidence, destination image appraisal, and value co-creation are positive outcomes associated with perceived value (Le, Mai, & Pham, 2023). However, value is relative and subject to change due to various factors, including context, industry, and time. Perceived value consists of four key components—experience value, cost value, service value, and resource value—that most significantly influence environmentally responsible behaviours among forest tourists (Liu, Wang, & Liu, 2022). As tourists engage with nature, listening to sounds such as birdsong and wind, they become more immersed and develop a deeper connection to the environment. This heightened perceived value encourages hikers to adopt environmentally responsible behaviours, making them more aware of ecological changes and fostering a greater sense of care for the natural world.

The Mediating Effect of Perceived Value

The Social Exchange Theory highlights individuals' decision-making processes, where they aim to maximise benefits and minimise costs in social interactions. Guests may decide whether to engage with their hosts based on the perceived value, assessing if the services provided outweigh the costs. However, varying interaction mechanisms can influence guests' perceptions. For instance, tenants sharing space with hosts may value social well-being, while those booking the entire space and avoiding contact may prioritise the space's functionality and economic value (Lee, 2022). Through positive Host-guest interactions, B&B hosts can communicate the destination's values and meanings, encouraging guests to engage in beneficial ecological actions and provide more favourable post-trip evaluations. When hosts offer diverse sensory experiences that align with guests' sensory needs—drawing on natural landscapes, local culture, natural sounds, and green products—they can significantly impact guests' perceived value and behaviours. This fosters a sense of responsibility towards nature, promoting harmonious coexistence between humans and the environment (Zhang, Guo, & Shen, 2022). Perceived value serves as a key bridge, connecting variables and influencing relationships.

The Mediating Role of Place Attachment

Bowlby (1977) introduced the concept of "place attachment" as a component of psychological attachment theory. In this framework, "attachment" pertains to the emotional connection, while "place" refers to the surrounding environment, encompassing both physical and social elements. An individual’s emotional bond with their geographic environment is shaped by the meanings they ascribe to it through their interactions with it. The validity of this two-dimensional structure has been corroborated in various contexts, with traditional research asserting that place attachment comprises two components: place identity and place dependence (Pineda et al., 2023). A person’s sense of place identity is forged through their connection to a specific environment. It is widely accepted that individuals feel an intrinsic connection with the location that best reflects their identity. In contrast, place dependence refers to an individual’s functional reliance on a particular location. Rather than being based on emotional attachment, its strength is determined by how effectively the location serves the functional needs of its users. This functional dependency forms the foundation of place attachment, which, in turn, can drive individuals to engage in specific behaviours tied to their affinity for particular places. Place attachment serves as a micro-level indicator of both affective and functional psychological states, and it is a critical variable in the "psycho-behavioural" framework for examining human-place relationships. This framework is valuable for understanding behavioural intentions,

particularly in the context of assistive technology. Consequently, place attachment plays a significant role in promoting eco-consciousness and fostering positive attitudes toward tourist destinations (Kalantidou, 2023).

Place Attachment and Host-guest Interaction

Tourists are more likely to develop a strong emotional connection to a location when they form social bonds or engage in meaningful activities. Physical sensations and interpersonal interactions contribute to creating this emotional attachment, especially when visitors leave their usual surroundings for a new destination. An individual's sense of place attachment is linked to the alignment between their travel goals and personal identity. When staying at rural bed and breakfasts, guests often bring with them expectations of a meaningful connection to the destination, shaped largely by social interactions. In Eastern cultures, the Host-guest relationship and the significance of the location are particularly valued (Zhang & Ji, 2022).

As China's rural population has increasingly migrated to urban areas, modern urbanites have developed a nostalgic attachment to rural life. This emotional connection fuels a desire for experiences that reflect the rural community's emotional essence. rural tourism and B&Bs have become behavioural strategies for temporarily addressing this need. The emotional bond fostered through prompt assistance, authentic communication, and dedication beyond contractual obligations enhances the "home atmosphere" of B&Bs, offering a more personal and emotionally fulfilling experience than hotels or other non-standard accommodations, which struggle to evoke the same "home feeling" and "human touch" (So, Kim, & Oh, 2021).

Pro-Ecological Behaviour and Place Attachment

An individual's sense of place attachment can significantly influence their level of commitment and responsibility towards a specific location, thereby overcoming contextual barriers to ecological behaviour, such as differing social norms and the accessibility of essential amenities. As a result, individuals are more inclined to engage in environmentally responsible actions when they feel a strong attachment to a particular place. Research has shown that guests who develop a deep connection to their accommodation or destination are more likely to exhibit eco-conscious behaviours and actively contribute to its preservation. This includes becoming more aware of environmental degradation, demonstrating a greater commitment to environmental protection, and incorporating respect for the natural environment into their daily routines (Chen et al., 2024).

Place Attachment and its Mediating Effect

Attachment is a multi-dimensional psychological framework that mediates the relationship between environmental cues and actions (Lewicka, 2011). The S-O-R theory, which underpins this framework, suggests a sequential link between stimuli, organisms, and responses. A substantial body of literature highlights the mediating role of attachment to specific locations. This study found that, in the tourism context, guests' ecological responsibility behaviour is influenced by the indirect effects of local identity and dependence, with local identity playing a more significant mediating role than chain mediation. Research by Irani, Rasoulzadeh Aghdam, & Ghasemzadeh (2023) in Iranian urban communities confirmed the mediating function of local dependency in the relationship between ecological intuition, social relationships, and pro-ecological behaviours.

In Rural-based B&B tourism, the rich Host-guest interaction and the functional and emotional aspects of the B&B give meaning to the place. This interaction strengthens the connection between guests and the location, facilitating the formation of local cultural identification and dependence. Guests create unique memories, develop a sense of belonging, and perceive the place as meaningful, leading to attachment. As a result, guests exhibit psychological tendencies towards convergence and positive behaviours, which, in turn, influence their ecological responsibility. The greater the personal attachment to the place, the more likely guests are to demonstrate pro-ecological behaviours (Li et al., 2023b).

Place Attachment, Perceived Value and Chain Mediation

Place Attachment and Perceived Value

In addition to providing accommodation, B&Bs act as a conduit for rural culture, enabling visitors to engage with the perceived cultural value of the items they encounter in their daily lives, thereby fostering a sense of place attachment. Huang & Bing (2021) utilised web scraping techniques on platforms such as Airbnb and Ctrip.com to investigate the relationship between guests' place identity and perceived value in B&Bs in Shanghai, China. Their study revealed that as guests' place identity strengthened, their cultural perceptions of the rural's B&Bs exhibited a more consistent spatial pattern. Furthermore, the researchers identified that the extent to which cultural perceived value was influenced depended on factors such as the accessibility of cultural information and guests' preferences for that information.

Place Attachment, Perceived Value and their Chain Mediation

Ecological actions among mass visitors are typically "extrinsically driven" rather than directly self-directed. The integration of "extrinsic motive" and "desire" into the Model of Goal-Directed Behaviour (MGB) may offer a more nuanced understanding of these behaviours. The process through which mass visitors engage in pro-ecological actions might be more effectively explained through the concept of "desire." The external driving influence of place attachment has been widely supported by relevant research. Jiang & Sun (2021) developed a model to explore how nostalgic feelings impact visitors' eco-conscious behaviours in cultural and historical districts, using the mediating roles of place attachment and perceived value. They found that visitors' environmentally

responsible actions were indirectly influenced by nostalgic emotions, which led to enhanced perceptions of value and a stronger connection to the place, ultimately fostering pro-ecological behaviours. The study also demonstrated that, through the mediation of place attachment, the perceived uniqueness of tourism destinations (especially island-based) significantly strengthened visitors' attachment to the place, thus encouraging value co-creation behaviours.

In the context of human-environment interaction, cognitive evaluation theory provides an underlying mechanism that enhances ecological sensitivity and bolsters the loyalty of rural boarding summer tourists. Place attachment, in this context, serves as a mediator in the relationship between ecological perception and tourist loyalty.

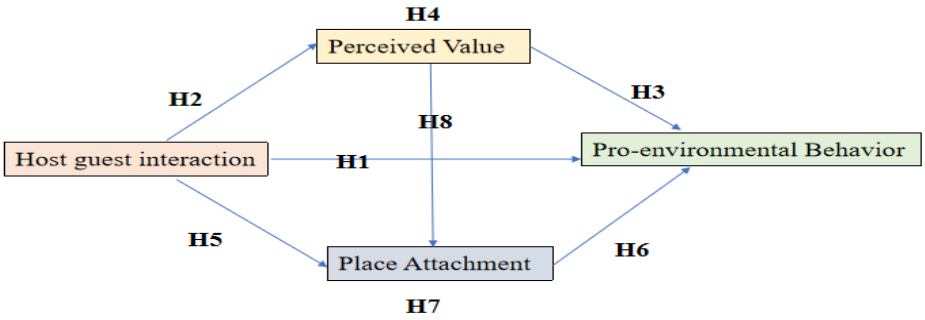

Figure 1: Conceptual Framework.

The Development of Hypotheses

The Table 1 presents both the hypotheses and their corresponding null hypotheses.

Table 1: Development of Hypotheses.

Hypothesis Number	Hypothesis	Null Hypothesis
H1	Host-guest interaction has a positive effect on guests' pro-ecological behaviour.	Host-guest interaction does not positively influence guests' pro-ecological behaviour.
H2	Host-guest interaction has a positive effect on perceived value.	Host-guest interaction does not positively influence perceived value.
H3	Perceived value has a positive effect on pro-ecological behaviour.	Perceived value does not positively influence pro-ecological behaviour.
H4	Perceived value mediates the relationship between Host-guest interactions and pro-ecological behaviour.	Perceived value does not mediate the relationship between Host-guest interactions and pro-ecological behaviour.
H5	Host-guest interactions positively influence on place attachment.	Host-guest interactions do not positively influence place attachment.
H6	Place attachment has a positive effect on pro-ecological behaviour.	Place attachment does not positively influence pro-ecological behaviour.
H7	Place attachment mediates the relationship between Host-guest interactions and pro-ecological behaviour.	Place attachment does not mediate the relationship between Host-guest interactions and pro-ecological behaviour.
H8	Perceived value positively influences place attachment.	Perceived value does not positively influence place attachment.
H9	Perceived value and place attachment have a chain-mediated effect on the relationship between Host-guest interactions and pro-ecological behaviour.	Perceived value and place attachment do not have a chain-mediated effect on the relationship between Host-guest interactions and pro-ecological behaviour.

Methodology

Study Context

This study focuses on guests at B&Bs in Yangshuo County, Guilin City, China. In 2023, Yangshuo County attracted 21.1143 million tourists, generating a total expenditure of 30.029 billion yuan, earning it recognition as one of China's top 100 counties for tourism strength. According to the Guilin People's Government Website, the region welcomed 21,015,600 domestic tourists, with a total domestic tourism expenditure of 29.780 billion yuan, while the number of inbound tourists reached 98,714,000. In recent years, the Yangshuo B&B sector has experienced significant growth. By the end of 2022, around 1,000 B&Bs in Yangshuo were listed on Ctrip (CTRIP, established in 1999, is China's largest integrated travel service company). The distribution of B&Bs is highly concentrated and corresponds closely to the distribution of tourism resources. The accommodation and the region's distinctive topography and landscape are interdependent, emphasising both natural and cultural vitality. This has led to the development of a unique model for accommodation that integrates ecology, culture, and tourism. Furthermore, rural village B&B tourism, characterised by experiential and participatory tourism, involves more frequent and intensive interaction between hosts and guests compared to other tourism activities. Therefore, Yangshuo's B&B guests provide a representative sample for this research.

Survey Design

Part one of the study's questionnaire captures demographic details such as respondents' gender, age, education, profession, and income. Part two includes factors related to demographic characteristics, while the second half contains measurement items for the four key constructs of interest. All four variables are second-order factors. As per Wang (2021), the subject-object interaction is assessed through three sub-dimensions: "service interactions" (5 items), "social interactions" (7 items), and "interaction quality" (5 items). Perceived value comprises five sub-dimensions: quality (6 items), social (3 items), emotional (5 items), knowledge (3 items), and cost (3 items). Place attachment is measured using ten items, two of which relate to the "dimensions of place dependence and place identity." Pro-ecological behaviours are evaluated using two dimensions: low-effort behaviours (3 items) and high-effort behaviours (items). All questions were rated on a 5-point Likert scale, where "1" indicates SD, "2" D, "3" N, "4" A, and "5" SA.

Data Collection and Sampling

When determining sample size, considerations such as confidence intervals, allowable errors, and sampling procedures are essential, in line with sociological research standards. Typically, a sample size to variable ratio of 5:1 is acceptable, though a 10:1 ratio is preferred when variables adhere to a normal or elliptical distribution (Huang, 2005). Since factor analysis is used to evaluate the questionnaire's reliability in this study, the sample size is determined based on the standards for factor analysis. The questionnaire comprises 59 items measuring four variables, indicating a required sample size between 295 and 590. A sample size of 500 is selected, accounting for factors like response rate and research validity. On 24th October 2023, an initial survey with 151 respondents was conducted to test the readability, clarity, reliability, and face validity of the instrument. In three separate sessions between November and December 2023, participants were asked to complete official questionnaires. The research team explained the study's purpose to participants, confirming whether they had previously stayed in a bed and breakfast. With their consent, the surveys were distributed for completion during their visit.

Data Analysis Method

The study employed SPSS 23.0 and AMOS 24.0 software for data analysis. A confirmatory factor analysis was conducted to evaluate key indices of the sample, including factor loadings, average variance extracted (AVE), and reliability (R.C.R.). To assess the model's fit and test the hypotheses, the following fit indices were applied: $\chi 2$/AGFI, NFI, RMSEA, df, GFI, IFI, and TFI. Additionally, discriminant validity of the variables was tested by examining their correlation coefficients. Finally, the relationships and influences among the variables were assessed using standardized coefficients and p-values. The results for each hypothesis were analysed, and meaningful conclusions were drawn from the discussion of these outcomes.

Data Collection

Sample Demographics and Descriptive Analysis

Out of the 500 surveys distributed, 450 responses were received. However, only 409 questionnaires were deemed suitable for analysis, as improperly completed ones were excluded. The descriptive characteristics of the primary sample are presented in Table 2.

Table 2: Sample Demographics and Characteristics.

Variable	Category	N=409 Frequency	Percentage
Gender	Female	230	56.2
	Male	179	43.8
Age	18-24	102	24.9
	25-34	138	33.7
	35-44	82	20
	45-54	40	9.8
	55-64	46	11.2
	65 or older	1	0.2
Education	High school or less	52	12.7
	University degree	320	78.2
	Master's or PhD	37	9.0
Guest Origin	In the province	183	44.7
	Out of province	226	55.3
Length of Stay	1day	44	10.8
	2-3days	314	76.8
	4days and above	51	12.5
Companion	Friend	181	44.3
	Family	171	41.8
	Group tour	43	10.5
	Alone	14	3.4

The gender distribution of the respondents was slightly skewed, with 43.8% male and 56.2% female participants. A significant portion of the sample, 50%, was under 34 years old, suggesting a predominance of younger travellers. Geographically, 55.3% of the respondents were from outside the Guangxi Zhuang Autonomous Region,

while 44.7% were local to the region. Regarding the duration of their stay, 76.8% of tourists spent 2-3 days at Yangshuo B&Bs. In terms of travel arrangements, most tourists preferred self-guided tours; 44.3% travelled with friends or family, while 3.4% journeyed alone. Only 10.5% participated in group tours, and 41.8% travelled independently.

Data Analysis

The official questionnaire comprises two key sections: the reliability test and the validity test, which assess the consistency and accuracy of the measurement tool, respectively.

Reliability Test

In this study, the reliability of the questionnaire was assessed using a Cronbach's Alpha (α) value in SPSS 22.0 for the collected samples. The results indicated strong consistency, with an overall internal consistency coefficient of 0.931 for the sample scale. Reliability indicators for all components were above 0.7, demonstrating excellent dependability of the scale. The reliability values for each component are shown in Table 3.

Table 3: Reliability Analysis.

Dimension (Math.)	Cronbach's Alpha	Quantities	Variant	Cronbach's Alpha	Quantities
PV1	0.924	5	PV	0.922	20
PV2	0.787	3			
PV3	0.821	3			
PV4	0.871	6			
PV5	0.881	3			
HG1	0.900	5	HG	0.911	17
HG2	0.902	7			
HG3	0.894	5			
PEB1	0.757	3	PEB	0.808	6
PEB2	0.840	3			
PA1	0.918	5	PA	0.913	10
PA2	0.927	5			

Validity Analysis

The validity evaluation of the scale in this study focused on both structural and content validity. The evaluation indices selected were based on well-established measures from previous scholars and were developed under the supervision of relevant experts and educators, ensuring relatively high content validity. The structural validity was assessed through confirmatory factor analysis (CFA), which included both convergent and discriminant validity. The scale, resembling a measurement instrument, was subjected to CFA using AMOS 24.

Structural Validity

The data were found to be well fitted by the "measurement model," as indicated by several fit indices. The χ^2/df value was 1.239 ($p < 0.05$), with other metrics such as CFI = 0.977, PCFI = 0.892, IFI = 0.977, RMSEA = 0.024, TLI = 0.974, PGFI = 0.772, and GFI = 0.878. In terms of absolute fit metrics, the chi-square value was 1560.182, with 1259 degrees of freedom, and the χ^2/df ratio was 1.239, while the RMSEA was less than 0.05. Regarding incremental fit metrics, the IFI, CFI, and TLI values exceeded 0.90, while the PGFI and PCFI values were below 0.5. All fit indices aligned with the threshold values, as presented in Table 4.

Table 4: Model Fit Measurement.

Metric	Description	Benchmark	Observed Value	Evaluation
Chi-Square (χ^2)	Statistical Measure of Discrepancy	—	1560.182	—
Degrees of Freedom	Number of Independent Comparisons	—	1259	—
χ^2/df Ratio	Model Fit Relative to Complexity	< 3	1.239	Acceptable
RMSEA	Estimates Model Fit Error	< 0.05	0.024	Acceptable
CFI	Comparative Fit Index	> 0.90	0.977	Acceptable
TLI	Tucker-Lewis Index	> 0.90	0.974	Acceptable
IFI	Incremental Fit Index	> 0.90	0.977	Acceptable
PGFI	Parsimonious Goodness-of-Fit Index	> 0.50	0.772	Acceptable
PCFI	Parsimonious Comparative Fit Index	> 0.50	0.892	Acceptable

Discriminant Validity and Convergent

Observations of convergent validity include factor loadings, C.R., and AVE. The factor loadings for the measurement items of each latent variable range from 0.60 to 1.00, surpassing the theoretical minimum of 0.60, indicating a strong relationship between the observed variables and their respective latent constructs. The C.R. value computed in this study is 0.80, well above the threshold of 0.60, confirming good internal consistency. Additionally, the AVE value exceeds 0.50, meeting the established criteria. Overall, the findings suggest that the observed indicators meet the basic requirements for convergent validity, demonstrating strong convergent strength of the survey measures, as shown in Table 5.

Table 5: Measuring the Convergent Validity of Scales.

Variant Measure	Term (Math.)	Standardised Coefficient	Standard Error	T-Value	P-Value	Factor Loading	AVE	CR
	H5	1				0.753		
	H4	0.971	0.064	15.081	***	0.741		
HG1	H3	1.082	0.065	16.76	***	0.816	0.643	0.900
	H2	1.079	0.062	17.436	***	0.846		
	H1	1.094	0.063	17.455	***	0.847		
	H12	1				0.739		
	H11	0.971	0.066	14.646	***	0.736		
	H10	1.004	0.065	15.366	***	0.770		
HG2	H9	1.004	0.067	15.07	***	0.756	0.570	0.903
	H8	1.04	0.068	15.312	***	0.767		
	H7	0.945	0.064	14.734	***	0.740		
	H6	0.971	0.063	15.466	***	0.775		
	H17	1				0.799		
	H16	1.045	0.057	18.39	***	0.833		
HG3	H15	0.945	0.058	16.253	***	0.754	0.629	0.894
	H14	1.002	0.058	17.407	***	0.797		
	H13	0.914	0.054	16.925	***	0.779		
	A5	1				0.853		
	A4	1.037	0.046	22.663	***	0.872		
PA1	A3	1.017	0.049	20.707	***	0.826	0.695	0.919
	A2	0.958	0.05	19.158	***	0.787		
	A1	0.968	0.047	20.737	***	0.827		
	A10	1				0.785		
	A9	1.16	0.055	20.986	***	0.907		
PA2	A8	1.135	0.055	20.574	***	0.894	0.720	0.927
	A7	1.076	0.057	18.752	***	0.833		
	A6	1.038	0.057	18.265	***	0.816		
	P5	1				0.885		
	P4	0.897	0.041	21.696	***	0.817		
PV1	P3	0.936	0.043	21.913	***	0.821	0.711	0.925
	P2	0.932	0.042	22.402	***	0.831		
	P1	1.001	0.042	23.986	***	0.861		
	P8	1				0.689		
PV2	P7	1.121	0.088	12.698	***	0.776	0.556	0.789
	P6	1.112	0.088	12.631	***	0.768		
	P11	1				0.784		
PV3	P10	0.99	0.066	15.019	***	0.778	0.603	0.820
	P9	0.985	0.066	14.875	***	0.769		
	P17	1				0.686		
	P16	1.02	0.078	13.017	***	0.722		
PV4	P15	1.218	0.089	13.653	***	0.763	0.532	0.872
	P14	1.155	0.088	13.136	***	0.730		
	P13	1.179	0.089	13.287	***	0.739		
	P12	1.155	0.088	13.191	***	0.733		
	P20	1				0.867		
PV5	P19	0.901	0.047	19.137	***	0.811	0.712	0.881
	P18	0.932	0.046	20.258	***	0.853		
	B3	1				0.728		
PEB1	B2	1.026	0.088	11.714	***	0.758	0.514	0.760
	B1	0.895	0.082	10.977	***	0.661		
	B6	1				0.783		
PEB2	B5	1.048	0.064	16.401	***	0.845	0.641	0.842
	B4	0.956	0.062	15.36	***	0.772		

To assess discriminant validity, this study employed the more stringent AVE method. Specifically, we ensured that the square root of the AVE for each factor was larger than the correlation coefficient between each pair of variables. After conducting correlation analyses using SPSS to obtain the variable-specific correlation coefficients, the AVE square root values were calculated and organised into a table. As shown in Table 6, the findings demonstrate

sufficient discriminant validity, as the correlation coefficients between any two dimensions are smaller than the square root of the AVE (diagonal values), indicating that the constructs are distinguishable from one another.

Table 6: Differentiation of Validity.

	HG1	HG2	HG3	PV1	PV2	PV3	PV4	PV5	PA1	PA2	PEB1	PEB2
HG1	0.802	-	-	-	-	-	-	-	-	-	-	-
HG2	0.475	0.755	-	-	-	-	-	-	-	-	-	-
HG3	0.355	0.401	0.793	-	-	-	-	-	-	-	-	-
PV1	0.164	0.181	0.236	0.834	-	-	-	-	-	-	-	-
PV2	0.134	0.144	0.154	0.506	0.848	-	-	-	-	-	-	-
PV3	0.211	0.153	0.199	0.529	0.422	0.843	-	-	-	-	-	-
PV4	0.164	0.119	0.159	0.449	0.404	0.496	0.745	-	-	-	-	-
PV5	0.190	0.165	0.141	0.465	0.425	0.330	0.374	0.777	-	-	-	-
PA1	0.173	0.127	0.202	0.320	0.297	0.316	0.223	0.183	0.729	-	-	-
PA2	0.194	0.159	0.140	0.347	0.293	0.360	0.250	0.230	0.470	0.844	-	-
PEB1	0.205	0.104	0.139	0.167	0.191	0.160	0.187	0.147	0.213	0.194	0.717	-
PEB2	0.242	0.210	0.231	0.316	0.209	0.272	0.331	0.253	0.243	0.330	0.435	0.801

Testing Hypotheses

Structural Equation Modelling (SEM) is a well-established multivariate statistical technique widely used across various academic fields to analyse the covariance matrix of variables and explain the relationships between them. In this study, we chose to apply SEM to further validate our proposed hypotheses and strengthen the evidence supporting our theoretical framework.

(1) Model Evaluation

All key fit indices that assess the adequacy of the theoretical model in relation to the data fell within the target range (χ^2/df = 1.305, $p < 0.05$, CFI = 0.987, TLI = 0.983, AGFI = 0.960, RMSEA = 0.027, NFI = 0.949, GFI = 0.975). Notably, the NFI, TLI, CFI, and AGFI values exceeded the recommended threshold of 0.90, while the RMSEA value was below the acceptable cut-off of 0.08. The measurement model, with 48 degrees of freedom and a chi-square/degrees of freedom ratio of 1.305, yielded a chi-square value of 62.631. These results demonstrate that the theoretical model fits well with the validation data Table 7.

Table 7: Model Fitting Results.

Fit Index	Acceptable Range	Observed Value	Assessment
Chi-Square	—	62.631	—
Degrees of Freedom	—	48	—
Chi-Square/DF Ratio	< 3	1.305	Acceptable
RMSEA (Root Mean Square Error of Approximation)	< 0.10	0.027	Acceptable
AGFI (Adjusted Goodness-of-Fit Index)	> 0.90	0.960	Acceptable
GFI (Goodness-of-Fit Index)	> 0.90	0.975	Acceptable
CFI (Comparative Fit Index)	> 0.90	0.987	Acceptable

(2) Estimation of Models (Test for Path Relationships in SEM)

The p-values and path analysis coefficients necessary for testing the research hypotheses are presented in Table 8. According to the results, subject-object interaction significantly and positively predicts perceived value ($p < 0.05$, SE = 0.105, $\beta = 0.382$), supporting hypothesis H2. Conversely, the place attachment hypothesis is rejected ($p > 0.05$, SE = 0.105, $\beta = 0.146$). This outcome provides support for hypothesis H8, which posits a significant positive predictive relationship between perceived value (PV) and place attachment (PA) ($p < 0.05$, SE = 0.105, $\beta = 0.146$). PV significantly positively predicts pro-ecological behaviour (PEB) ($p < 0.05$, SE = 0.071, $\beta = 0.225$), confirming hypothesis H3. Additionally, PA also significantly positively predicts PEB ($p < 0.05$, SE = 0.083, $\beta = 0.296$), further supporting hypothesis H3. Finally, hypothesis H6 is confirmed, as the positive predictive effect of Host-guest interactions (HG) on PEB is statistically significant ($p < 0.05$, SE = 0.085, $\beta = 0.231$), thereby supporting hypothesis H1.

Table 8: Model Estimation Results.

Trails	Standardised Path Factor	Unstandardised Path Coefficients	Standard Error S.E.	Critical Ratio C.R.	Significance P	Suppose that
PEB<---HG	0.231	0.242	0.085	2.838	0.005	H1
PV<---HG	0.382	0.546	0.105	5.173	***	H2
PEB<---PV	0.225	0.165	0.071	2.322	0.020	H3
PA<---HG	0.146	0.204	0.105	1.936	0.053	H5
PEB<---PA	0.296	0.221	0.083	2.674	0.007	H6
PA<---PV	0.570	0.558	0.076	7.298	***	H8

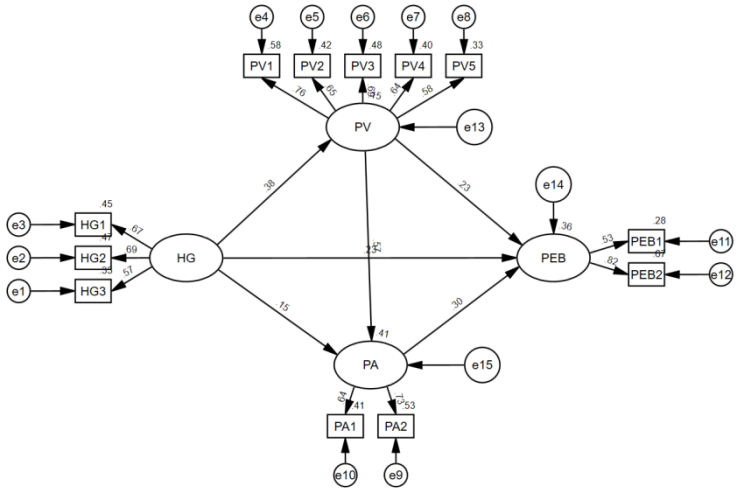

Figure 2: Model Estimation Results.

(3) Test of Mediation Effect

The mediating mechanisms of the proposed model were examined using chain mediation analysis, a form of serial mediation analysis. Theoretical pathways identified in the model suggest that guests' pro-ecological behavioural attitudes are influenced by subject-guest interactions through three mediating channels: perceived value, place attachment, and interactional dynamics. To investigate the mediation effect, the Bootstrap method in AMOS24.0 was employed, with 5000 Bootstrap repeated samples drawn to generate an approximate sampling distribution. The mediation effect was tested by assessing whether 0 fell within the 95% confidence interval. The results showed that Hypothesis H4 was validated, as perceived value (PV) significantly mediated the relationship between Host-guest interactions (HG) and pro-ecological behaviours (PEB), with an effect value of 0.090 and a 95% confidence interval (CI) of [0.016, 0.216] (Bias-corrected $p < 0.05$) and a 95% CI (Percentile $p < 0.05$) of [0.008, 0.201], confirming its significance.

Hypothesis H7 was rejected, as place attachment (PA) did not significantly mediate in the relationship between HG and PEB. The 95% confidence intervals under both the Bias-corrected [CI = -0.005, 0.141] and Percentile [CI = 0.000, 0.096] methods did not contain 0, indicating that the mediation effect was not significant, and the effect value was 0.045. Hypotheses H8 and H9 were confirmed, with subject-object interaction leading to perceived value, which in turn leads to place attachment, and ultimately, an increased willingness to engage in pro-ecological behaviours. The effect was significant ($p < 0.05$, $\beta = 0.067$), with the Bias-corrected 95% CI of [0.021, 0.169] and the Percentile 95% CI of [0.016, 0.149], both $p < 0.05$, indicating a positive mediation path. These findings are detailed in Table 9.

Table 9: Mediation Effect Test.

Parameter	Estimate	Lower	Upper	P	Efficacy as a Percentage of
ind1	.090	.008	.201	.031	20.27%
ind2	.045	-.005	.141	.094	10.14%
ind3	.067	.016	.149	.011	15.09%
total	.444	.249	.678	.000	
r1	.203	.017	.476	.031	
r2	.102	-.011	.298	.094	
r3	.152	.038	.343	.011	
diff1	.045	-.102	.186	.489	
diff2	.023	-.111	.156	.674	
diff3	-.022	-.112	.055	.529	

Discussion

This study aims to develop and test a theoretical model explaining the connections between Host-guest interactions, value perception, place attachment, and the likelihood of visitors engaging in environmentally friendly actions. The findings have significant implications for the travel and tourism industry. The chain mediation effect offers a deeper understanding, with this study being one of the first empirical investigations confirming the critical role of Host-guest interactions in promoting visitors' environmentally responsible behaviours. It also highlights both cognitive and affective factors. The research explores the relationship between place attachment and perceived value, and their complex links to visitors' pro-ecological actions, focusing on the chained mediation effect that underscores visitors' environmental views and perceived trip value.

The study found that the Host-guest relationship positively influences pro-ecological behaviour. Through personal and authentic cross-cultural exchanges with B&B hosts, urban B&B visitors experience a more immersive form of

tourism, bringing them closer to the "real life" of their chosen destination. Host-guest interactions enhance understanding, alleviate anxiety, and generate empathy, particularly through service and social interactions. These interactions, especially those focused on the humanities and natural beauty, encourage guests' willingness to engage in pro-ecological behaviours. The goal is to promote eco-friendly actions by reshaping the decision-making context rather than restricting freedom of choice or influencing the merits of potential actions (van Valkengoed, Abrahamse, & Steg, 2022), thus avoiding interference with guests' natural decision-making processes.

Ethical behaviours and Host-guest interactions are mediated by perceived value. According to the study, substantial contact between hosts and guests, particularly through interactions with service personnel, enables guest satisfaction with a "carefully designed" and "staged" experience. In Rural-based B&B tourism, the quality of service and social interactions significantly impacts the perceived value for guests. The effect of positive attitude assessments on behaviour has been further validated (Geiger et al., 2019). The more positive the net benefit that locals perceive from tourism, the more willing they are to embrace it. When people engage in conversations, they learn about each other's experiences, fostering empathy and support. This "proper" exploration leads guests to form positive opinions about the destination.

Although a positive correlation was found between Host-guest interactions and place attachment, the strength of this relationship was insufficient to establish place attachment as a mediator between Host-guest interactions and pro-ecological behaviours. Possible explanations include: (1) the development of visitors' feelings of place attachment is not clustered and depends on the level of guest engagement, which contrasts with the strong native affiliation of locals to the place (Lewicka, 2011); since the research subjects were mainly short-stay guests (1-2 days), forming strong place attachment is challenging; (2) guests primarily focus on relaxation and hedonistic enjoyment during their trip, and interactions with the host are initially viewed as a product that enhances the guest experience. According to social exchange theory, both parties assess the results of the interaction, influencing subsequent behaviours. Thus, rather than being driven by emotional connections, guests' participation in pro-ecological behaviours is constrained by logical evaluations of the advantages and costs of such actions (Chen, Zhang, & Hu, 2022).

The Host-guest interaction and its link to guests' pro-ecological behaviours are mediated by place attachment and perceived value in a chain reaction. In the context of Rural-based B&B tourism, guests do not engage in pro-ecological behaviours primarily for ecological protection but rather due to the importance of ecological preservation in the countryside, which fulfils their specific destination experience needs. When guests perceive higher value, it fosters deeper place attachment, the formation of a place-self identity, and a stronger psychological connection with the destination. To meet their destination-specific needs, they become more inclined to protect "their" destination from harm, which, in turn, promotes pro-ecological behaviours. This highlights place attachment as a crucial mediating variable that transduces perceived value into pro-ecological actions.

Practical Significance

Tourist planners and municipal governments can benefit from the study's management suggestions, especially for urban B&Bs. Tourist development plans should integrate the support of B&B owners and local residents to foster industry growth and hospitality. The involvement of rural residents and business owners in the hospitality sector provides opportunities for meaningful Host-guest interactions and authentic experiences. In Yangshuo County, China, B&B tourism relies on high-quality social connections (0.69) and interaction ratings (0.57) to enhance visitors' perceived value. Unlike impersonal hotel services, rural accommodations highlight local culture, enabling guests to immerse themselves in the host's language, customs, and activities, while receiving emotional support and creating a welcoming atmosphere. This deepens emotional exchanges and strengthens guest attachment to the location, encouraging positive behaviours.

Ecological appeals alone are insufficient to alter guest behaviour towards greater ecological friendliness. The impact of guests' perceived ecological knowledge on pro-ecological behaviours was weak (0.58), while cost perception (0.69) and emotion-based communication (0.76) had a more significant effect. Emphasising community building through information sharing and local cultural experiences can enhance tourism, improve emotional perceptions, and increase post-tour engagement. Collecting customer feedback promptly allows for service optimisation. Additionally, altering attitudes through information about the non-ecological benefits of behaviours can help promote eco-friendly practices by highlighting their connection to enhanced tourist experiences and financial gains.

While sentiment is central to the charm of B&Bs, relying solely on it limits guests' emotional attachment to the location. By focusing on Host-guest interactions, B&B owners can create a "home" environment that strengthens social connections between guests, operators, and the community. Meaningful interactions transform guests into active participants, fostering interconnected identities and a deeper appreciation for the place. These interactions, combined with emotional resonance and value-for-money perceptions, deepen guests' emotional ties to the destination, create lasting memories, and encourage ecological responsibility and convergent thinking.

Limitations of the Study and Further Research

The methodology of this paper presents several limitations. Firstly, it focuses solely on Rural-based B&B guests in Yangshuo County, Guilin, which may not be

representative of other regions. Secondly, the study does not include multiple case locations for data collection, limiting its generalisability. Thirdly, it fails to consider the influence of interaction styles in regions with varying cultural practices. Additionally, the sample used in the study has specific constraints that may affect the results. To enhance the validity and applicability of the suggested model, future research should assess the relationships between variables across various destinations, considering different levels of development and growth patterns. The explanatory power of the model could also be strengthened by incorporating additional variables, such as the personal characteristics of the B&B owner, the scale of the B&B's resources, guests' excursion experiences, and demographic factors like gender and age. Furthermore, the role of Host-guest interactions in shaping guests' pro-ecological behaviours warrants further exploration. For a more comprehensive understanding, future studies could include qualitative research to supplement quantitative findings, providing deeper insights into the relationships and their boundary conditions. Lastly, the study's reliance on automatic mechanisms may limit the generalisability of its results, as the focus on automated processes does not address the underlying drivers of ecological behaviour, making it less applicable outside the guest context.

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