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Formation mechanism of tourists' pro-environmental behavior in plateau ecotourism destination

Lulu Wang[1], Hu Yu[2]✉ & Bin Zhou[3]

In response to the scarcity of research on the psychological factors and formation mechanism of tourists' pro-environmental behavior in plateau ecotourism destinations, this study takes the Shangri-la in Yunnan-Guizhou Plateau as a case, developed an integrated model and tested with structural equation model to obtain accurate and unbiased path coefficients, and jointly exploring the formation mechanism of tourists' pro-environmental behavior in plateau ecotourism destination. Based on the stimulus-body-response theory and rational behavior theory, this study conducted field investigations and acquired 516 questionnaires. Through analysis, it was discovered that the pro-environment behavior of tourists in plateau ecotourism destinations is influenced by external contextual factors and internal psychological factors. The natural environment and the cultural atmosphere can evoke tourists' awe, and then awe can directly and positively influence pro-environment behavior, and indirectly influence pro-environment behavior through the dual paths of self-attitude and subjective norms. The conclusion explains the internal logic and action mechanism of tourists' pro-environment behavior in plateau ecotourism destination, and provides a reference for decision-making in plateau ecotourism destination's construction and the cracking of tourists' negative environmental impacts.

[1] Zhejiang Technical Institute of Economics, Hangzhou, China. [2] Institute of Geographic Sciences and Natural Resources Research, Beijing, China. [3] Department of Tourism, Ningbo University, Ningbo, China. ✉email: yuhu@igsnrr.ac.cn

Introduction

Ecotourism is growing at a rapid rate of 10–12% per year, and plays an active role in promoting global economic growth (Bui & Saito, 2022) and social employment (Camargo et al., 2022), enhancing cultural exchanges (Park & Kovacs, 2020), improving infrastructure (Chen & Yang, 2020), enhancing the brand image (Mitchell & Gallaway, 2019) and many other aspects. In China, ecotourism, as a resource utilization method to promote the harmonious development of man and nature, is establishing a green development model based on the good natural ecological environment and the human ecology co-existing with it, on the premise of protecting the ecological environment (Li & Wu, 2020). Due to the difference or limitation of regional development capacity and tourism-supporting conditions, the negative impact of ecological environment associated with ecotourism development still exists and is becoming increasingly significant, which is strongly reflected in the plateau area (Kurtaslan & Demirel, 2011). Although previous studies have studied ecological and environmental issues such as lakes (Li et al., 2019), wetlands (Li et al., 2018), forests (Zhang et al., 2018), mountains (Xu & Tu, 2021) and deserts (Wang et al., 2022), and call for tourism income to return to environmental protection, and intelligent regulation and control of tourist flow in peak season to improve the order and management level of destinations.

However, the contradiction between ecological protection and responsible environmental behavior is still prominent in plateau tourism destinations with sparse population, fragile ecology and limited conditions (Kurtaslan & Demirel, 2011), because usually adopting passive management models and control measures can not really solve the environment problems brought by tourists. The subjective uncivilized tourism behaviors of tourists, such as littering (Panwanitdumrong & Chen, 2021), climbing and breaking flowers and trees, destroying tourism facilities, not respecting local culture and customs (Qu et al., 2021), have threatened the fragile environment and the relationship between host and guest of plateau tourism, and brought about a series of consequences affecting the sustainable development of plateau tourism, such as plateau environmental pollution (Shetawy et al., (2009)) and landscape resource destruction (Gao et al., 2017). It has become the biggest killer affecting the sustainable development of plateau tourism, such as plateau environmental pollution and landscape resource destruction. Tourists' pro-environment behavior (PEB) reflects the social attributes of altruism and collectivism (Li & Wu, 2020), and plays a positive role in reducing the negative impact on the environment (Lin et al., 2022) and promoting environmental cleanliness or sustainable use of resources (Patwary, 2023). It is considered as one of the effective ways to deal with the ecological difficulties of tourist destinations (Han, 2021) and is constantly encouraged (Steg & Vlek, 2009). Therefore, research on the formation mechanism of tourists' PEB is of great practical value for scientific environmental management in plateau ecotourism destination (PETD).

Psychological factors, as the direct drivers of individual behavior generation (Lu et al., 2020), have the most significant intervention effect on tourists' PEB (Wang et al., 2019). Existing literature has extensively explored three main psychological factors that influence tourists' PEB: the first is rationality. PEB research began with the assumption of rational man, that individuals always aim to maximize profits (Ajzen, 1991), and which believes that the influence of rational cognition, such as environmental knowledge (Liu et al., 2023) and environmental interpretation (Wang & Li, 2018), positively affects tourists' PEB. The second is morality. With the depth of research, the theory of reasoned action (TRA) was proposed, scholars introduced subjective norms (SN), social norms and other moral factors (Zebardast & Radaei, 2022), that in a specific tourism situation, morality is more able to dominate the tourists' PEB compared to rationality (Li & Wu, 2019). In addition, PEB essentially has a strong moral significance (Wu et al., 2021), and the moral detachment is one of the most important factors that inhibit the tourists' PEB (Wang et al., 2021). The third is emotion. It is gradually emphasized after rationality and morality, plays an independent and dominant influence in people's response to social situations (Zajonc, 2000), and Ability to exhibit PEB (Xia et al., 2023).

At present, scholars have introduced emotional factors such as satisfaction, emotional experience (Li et al., 2023), and awe (Xiong et al., 2023) into rational or moral theories, confirming that emotion has a stronger driving effect on tourists' PEB (Xu et al., 2022). The development of academic theories is time-dynamic, and the research on the psychological factors of tourists' PEB follows the order of first rationality, then morality and then emotion. Scholars first introduced the theory of bounded rationality, rational behavior theory, planned behavior theory and so on to explore the influencing factors of PEB, such as cognitive and behavioral attitudes, subjective norms and so on. Then, it introduces the normative activation theory and other theories to discuss the influencing factors of PEB from rational and moral perspectives and adds moral norms and social norms. The emotion-behavior theory is also introduced to discuss the influence of positive emotions such as pride, pleasure and awe on PEB from the perspective of emotion. However, existing studies only select one or two psychological factors from rationality, emotion, and morality PEB, ignoring the psychological complexity of tourists' PEB decision-making in plateau ecotourism situations. Especially in the special contexts of PETD, large-scale shocking geological terrain, vegetation style, national culture, religious culture and other natural and cultural landscapes can significantly cause tourists to change in the three psychological elements of rationality, emotion and morality. Therefore, there is still a gap on how to comprehensively analyze the relationship between the three psychological factors and the tourists' PEB.

Tourism behavior is not only limited by the individual's internal psychological force, but also the external environment changes play a large role (Salancik & Pfeffer, 1978). Tourists are in a non-customary environment, facing more uncertainty, relying on the resources and atmosphere provided by the destination, interacting and synergizing with the destination scene all the time, their attitudes and behavioral choices are more socially adaptive (Salancik & Pfeffer, 1978). In recent years, scholars have explored the influence of tourism contextual factors such as imagery of tourist places and destination atmosphere (Kong et al., 2020) on tourists' PEB. Studies have shown that a quality tourism context can adjust tourists' attitudes and behavioral outputs, and help tourists return to the destination with positive motivation, willingness and action (Cheng & Wu, 2015). However, how the tourism context acts on the three psychological factors of tourists' rationality, morality, and emotion, and how they work together to influence PEB have not been studied. At the same time, PETD has unique geological landforms, mountains and valleys, snow-capped mountains and lakes, religious beliefs, customs, and folk esthetics, which highlight the distinct characteristics of holiness, holiness, mystery, reverence, etc., which are different from general tourism destinations. These changes will inevitably bring different psychological motivations to tourists. Therefore, the formation mechanism of tourists' PEB from the contextual and psychological multifactorial perspectives remains an open question.

To sum up, what is the novelty of plateau tourism destination situation in driving tourists' PEB? What psychological changes it causes tourists? How the relationship between psychological factors affects PEB, and how to explore the formation mechanism

of tourists' PEB with innovative measurement scales remain unresolved. This study takes Shangri-La, a typical ecotourism destination in Yunnan-Guizhou Plateau of China, and try to make the following contributions by exploring the formation mechanism of tourists' PEB in the PETD. First, we introduce Stimulus-Organism-Response theory (SOR) and the theory of reasoned action (TRA) to creatively explore the formation mechanism of PEB from the two dimensions of tourists' external context and internal psychology. Second, we synthesize for the first time the rational, moral, and emotional dimensions of psychological factors, which help to accurately predict the complex psychology of tourists' PEB. Third, we examine the effects of the natural environment (NE), the cultural atmosphere (CA), awe, SN and self-attitude (SA) on tourists' PEB, which fill the gap in research on the formation mechanism of tourists' PEB. This study also offers valuable policy implications for decision makers to understand plateau tourists' PEB and take correct management decisions.

Theoretical foundation and literature review

Theory of reasoned action (TRA). TRA, proposed by Fishbein and Ajzen, holds that behavioral willingness is influenced by SA, SN, and can effectively intervene and predict behavior from a psychological perspective (Ajzen, 1991). Among them, SA is the result of an individual's assessment of the degree of favorable or unfavorable, when an individual believes that his or her own behavior is beneficial and valuable, the more positive his or her attitude bias and normative strength will be (Esfandiar et al., 2022), and the stronger the individual's behavioral willingness will be (Li & Wu, 2019). Tourists' environmental values and knowledge are an important basis for measuring SA, significantly and positively influencing their behavioral intentions (Rodriguez-Oromendia et al., (2013)). SN balance interpersonal and interpersonal-land relationships through public opinion, social and self-monitoring, with distinct social constraints and moral norms. Individuals obtain the expression of self-value and the satisfaction of self-recognition in the process of complying with SN (Planas, 2018), and this moral motivation prompts individuals to respond with pro-social behaviors. In the tourism context, the guidance of others assists tourists with generating environmental willingness to regulate their own behavior. Simultaneously, when tourists become aware that they have violated the rules of the tourist destination, particularly when negative environmental consequences have occurred, they are prompted to take responsibility and make amends with PEB (Tangney et al., 2004).

To explore the decision-making influence of individual psychology on behavior from the three dimensions of morality, rationality and emotion, although TRA encompasses rationality and morality, it is necessary to incorporate the emotional dimension to form an extended TRA. Awe is one of the discrete emotions highly related to tourism (Tian et al., 2015a), and when tourists are faced with things that are vast and beyond the tourists' current scope of understanding, their complex emotions are readily triggered, resulting in awe mixed with admiration, wonder, reverence, and other feelings (Dong et al., 2013). At the same time, the awe can prompt tourists to think critically, revisit their previous rational and moral memories, and enhance their sense of connection with others or nature, influencing tourism behavior decisions (Krause & Hayward, 2015). Therefore, awe, as a component of the emotional dimension, along with SA and SN, constitutes the three main components of the psychological genesis of tourists' PEB.

Stimulus-organism-response theory (SOR). SOR was proposed by Mehrabian to explain the effects of stimuli from external environmental factors on people's internal states, which are ultimately manifested as a series of individual behavioral responses (Mehrabian, 1974). The SOR model is a sequential mechanism (Talwar et al., 2023), consisting of a stimulus component, an impact component (a set of mediating or intervening variables), and a response component in a sequential order (Donovan & Rossiter, 1982). Specifically, the stimulus component refers to the social and physical environment that can cause changes in an individual's perceptions, the influence component is the changes in an individual's internal cognition and emotion, and the response component is the individual's attitude and behavior (Hempel & Hamm, 2016).

SOR provides a suitable theoretical basis for the PEB formation mechanism in this study for the following reasons: first, studies have applied SOR to various contexts to explore the influencing factors and processes of tourists' PEB. For example, Homer utilized the SOR to effectively explain the relationship between the nature-based tourist destinations, loyalty, and PEB (Wu et al., 2022). Second, the formation process of tourists' PEB is complex, and SOR, a sequential mechanism, can effectively deal with these complex aspects, elucidating the series of activities of external stimuli, internal transformation and behavioral externalization. Third, SOR is flexible and scalable to respond to a wide range of research content, and has been applied to predict individual behavior in multiple contexts such as environmental psychology (Hu et al., 2021), consumer behavior (Xu et al., 2020), and environmental protection behavior (Liu et al., 2020), and tourist travel experience (Bai et al.,2024) with validity. Therefore, in order to systematically investigate the formation mechanism of tourists' PEB, this study proposes a conceptual model from the contextual and psychological perspectives, using the SOR to explain the relationship between tourism context (stimulus), tourists' psychological state (organism), and PEB (response).

Aiming at the special case of PETD, in order to highlight the application of SOR in tourists' PEB in PETD, this study not only presents the special attributes of PETD but also emphasizes the uniqueness of the stimulation part of SOR through the original ecological, sacred, mysterious and awe-inspiring natural landscape and cultural atmosphere. Simultaneously, this study adopts the extended TRA to comprehensively explore the multiple psychological factors, and takes the three psychological factors of rationality, emotion and morality as the organism part of SOR, to comprehensively reflect the psychological changes brought by the natural landscapes such as snow mountains, plateau lakes, rare animals and plants, and the cultural landscapes such as ancient city culture, religious culture and living customs in the PETD. Therefore, this study integrates SOR with the extended TRA, in order to better interpret the formation mechanism of tourists' PEB in the special context of PETD.

Theoretical background and research hypothesis

Tourism context evokes tourists' awe. Context was first introduced by psychologist Lewin and became one of the core of psychological research, Lewin considered context as a behavioral environment (Belk, 1975), which is able to synthesize a variety of interacting factors in a particular time or space and have an impact on the subject's current behavior. In the tourism context, physical and social environment such as natural ecology and religious culture are the main components of the tourism context. Most of the PETD carry tourists' demand for natural scenery and religious culture experience at the same time (Wang & Lyu, 2019). At the same time, the emotion evaluation theory holds that people's cognitive evaluation is an information-processing process in which discrete emotions are screened and evaluated to produce cognitive evaluation of the surrounding environment,

and directly affect individual behavioral decisions (Ross & Nisbett, 1991).

In a fluid environment, tourists perceive discrete emotions brought by individual stimulation of different environmental atmospheres (Xie, 2005), Will form different individual mental representations (Zhang et al., 2019). for example, tourists have a strong degree of Psychological fluctuations such as satisfaction, awe (Niu & Liu, 2022), local dependence, and local identity (Qi et al., 2018) by perceiving the situation of the tourist destination (Chen et al., 2017). Among them, awe is a discrete emotion closely related to the tourism context (Tian et al., 2015b). According to the core characteristics and triggering conditions of awe mentioned by Shiota (Shiota et al., 2007) and Keltner (Keltner & Haidt, 2003), awe can be triggered in tourist situations and become one of the most anticipated emotional experiences for tourists (Coghlan et al., 2012).

Studies have shown that it has been demonstrated that these tangible physical and intangible social and cultural contexts are the main causes for inducing tourists' awe (Jepson & Sharpley, 2015). A series of empirical studies prove that: grandiose scenes such as majestic mountains and sacred temples can evoke tourists' awe (Shiota et al., 2007). When faced with natural landscapes with a strong sense of experience, tourists feel awe due to the wonder, grandeur and extremity of the landscape, which in turn increases their sense of experience, satisfaction (Cajiao et al., 2022) and behavioral willingness (Rodrigues et al., 2022). A strong religious atmosphere such as deity pilgrimage and sacred rituals can likewise stimulate tourists' awe to regulate PEB (Tian et al., 2015b).

Therefore, this study proposes the following hypotheses:

H1: NE of tourist destinations positively affects their awe

H2: CA of tourist destinations positively affects their awe

Effects of awe on SA, SN and PEB. According to the positive emotion extension theory, positive emotions enable individuals to generate more thinking activities, enhance cognitive initiative and flexibility through broadening the "thought and behavior" mechanism and constructing corresponding psychological, social and individual resources (Fredrickson, 2001). According to the prototype theory of awe, awe can promote individuals to have positive thinking and make behaviors that are beneficial to others and society (Su & Zhang, 2016), and demonstrate pro-social functions including PEB (Wang & Lyu, 2019). In the context of tourism, when awe is aroused, tourists will put their own interests after the natural needs, update their own psychological schema, and re-identify and accept the surrounding environment and things (Keltner & Haidt, 2003). Emphasis is placed on individual integration and conformity to group requirements (Van Cappellen, Saroglou (2012)), deepening the rational cognition and moral cognition of environmental protection, not only strictly abiding by the civilized tourism norms of tourist areas, and exhorting others' actions against the environment.

For example, when awe is aroused, Tourists are more likely to believe that rational cognition such as protecting environment and culture is wise and beneficial (Wang et al., 2019), the moral perception that society and people around us advise PEB is correct (Chen et al., 2021). Meanwhile, Yan (Yan & Jia, 2021) for Haizhou Guandi Temple, Niu for Yuntai Mountain Scenic Area (Niu & Liu, 2022), Tian's study on Tibet (Tian et al., 2015b) and Qi's study on Qianshan Scenic Area (Qi et al., 2018), show that tourists' awe towards nature and religious atmosphere has a positive effect on their PEB. In the context of PETD, awe stimulated by plateau tourism contextual perception, as a positive emotion, will have a positive impact on tourists' rational cognition, moral cognition and pro-environment behavior.

Therefore, this study proposes the following hypotheses:

H3: Tourists' awe positively affects their SA

H4: Tourists' awe positively influences their SN

H5: Tourists' awe positively affects their PEB

Influence of SA and SN on PEB. TRA suggests that SA, as one of the earliest factors included in the study of influencing behavioral decisions, plays a key role in individual PEB (Borden & Schettino, 1979). In terms of specific research, SA, as a rational motivation, is embodied in the individual's rational measurement and basic cognition, and its factors include environmental knowledge, environmental awareness, environmental attitude and so on. When a person has a certain knowledge, attitude and awareness of environmental protection, it is easier to perform PEB in tourism activities. Empirical research confirms that tourists' environmental awareness and attachment is a kind of environmental responsibility (Wong & Lai, 2024) and have a significant positive effect on PEB (Foroughi et al., 2022). Meanwhile, Wang (Wang et al., 2018) took Huangshan Scenic spot in China as a case study and the results showed that tourists' environmental attitude had a positive effect on PEB. All the above studies have proved that SA such as environmental knowledge, environmental attitude and environmental awareness has a positive effect on tourists' PEB.

The environmental problem is not only an economic and political issue, it is fundamentally a moral issue. A moral response is needed (Williston, 2011). As a kind of pro-social behavior, PEB has distinct altruistic attributes and strong moral significance and can guide individuals to tend to meet the public interest of positive behavior. In TRA, SN refers to a set of rules and standards that guide social individuals and groups to comply with the social-environmental order and are able to influence the consistency of social activities and the social goals' realization by changing individual behavioral decisions (Onwezen et al., 2013). Subjective norms are highly effective in promoting PEB among tourists (Gupta & Sharma, 2019). Subjective normative factors such as conservation commitment and responsibility attribution can all constrain tourists' behavior and have a significant positive correlation with PEB (Patwary, 2023). Destination managers using regulatory strategies and on-site information strategies such as rewards and sanctions can arouse tourists' moral concern, and realize the influence of subjective norms on PEB (Li & Wu, 2019). All of the above studies show that SN such as persuasion and regulation have a significant effect on tourists' PEB.

Meanwhile, synthesizing the analysis of awe acting on self-attitude and subjective norms, this study proposes the following hypotheses

H6: Tourists' SA positively affects their PEB

H7: Tourists' SN positively affect their PEB

H8: SA plays a mediating role in the influence of tourists' awe on their PEB

H9: SN plays a mediating role in the influence of tourists' awe on their PEB

Chain-mediated effects of awe, SA and SN. According to existing studies on awe-inducing factors, physical (mountains, deserts, rivers and seas, etc.) and social (religion, music, dance, etc.) factors are important inducers of tourists' awe (Tian et al., 2015a), and the NE and CA conform to the stimulus component of SOR. When tourists perceive the psychological stimulation of multiple triggers in a specific tourism environment, psychological changes of varying intensity are formed, including awe, SA, and SN, in which awe can boost tourists to reduce their self-consciousness and egoism and activate their SA and SN (Powell et al., (2012)), which are part of the influence on organisms part

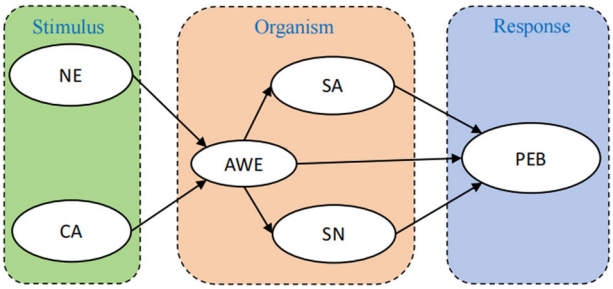

Fig. 1 Research model. In the figure, Stimulus, Organism and Response represent the stimulus component, impact component and response component of Stimulus-organism-response theory respectively. In the context of plateau ecotourism, NE(natural environment) and CA(cultural atmosphere) can stimulate individuals to perceive the changes of social and physical environment, which belongs to the stimulus component. AWE(awe), SA(self-attitude) and SN(subjective norms) show the changes of individual cognition and emotion from three dimensions of emotion, rationality and morality respectively, which belong to the impact component. PEB(pro-environment behavior) are externally-manifested attitudes and behaviors, which belong to the response component. NE and CA stimulate individuals to produce changes in AWE, SA and SN, affecting the external behavior of PEB.

of SOR and the extended TRA. Tourists, by virtue of psychological adjustments to adapt and conform to the current environment, engage in PEB and adapt to the needs of the tourist environment (Niu & Liu, 2022), which belongs to the reactive part of SOR. Based on the above findings, tourism contextual factors can positively stimulate tourists' awe, which in turn acts on their SA, SN and PEB. By deduction, there is a chain mediating role of awe, SA and SN between tourism context and PEB.

Therefore, this study proposes the following hypotheses:

H10: awe, SA and SN play a chain mediating role in the influence of tourists' NE on PEB

H11: awe, SA and SN play a chain mediating role in the influence of tourists' CA on PEB

The conceptual model is shown in Fig. 1.

Methodology

Research area. Shangri-La has always been known as "Shangri-La in the heart, the last pure land on earth" by tourists all over the world, and it is a must-visit place for many people to travel in their lifetime. With a total area of 11,600 square kilometers and an average altitude of more than 4000 m, Shangri-La is rich in resources and magnificent in landscape, possessing natural landscapes such as snow-capped mountains, lakes, and canyons, as well as preserving authentic ethnic cultures, original village landscapes, and intangible cultural heritages (Fig. 2). The Shudu Lake, the Dukezong ancient town, the Napa lake, and the Songzanlin temple are popular plateau ecotourism sites, which fully demonstrate the characteristics of the dual tourism context of nature and culture in plateau ecotourism destination, and satisfy tourists' psychological needs for experiencing mystery and awe on the plateau. In 2022, Shangri-La hosted up to 16,514,000 domestic and foreign tourists. However, the continued growth in the number of tourists, the uncivilized tourism behaviors and negative ecological damage occur frequently, so guiding tourists' PEB is an important way to solve this problem. Therefore, this study takes Shangri-La as a typical case to explore the formation mechanism of tourists' PEB in PETD.

Research design. This study introduces the SOR and the extended TRA to explore the path relationships and validity of the model of tourists' PEB formation mechanisms in PETD. Based on the model constructed above, adhering to the principles of scientific objectivity and comprehensiveness, this study systematically analyzes the uniqueness of plateau ecological environment and tourism resources, the complexity of tourists' psychological factors, and attempts to innovatively construct measurement scales for PETD. Structural equation modeling is used for quantitative analysis to effectively judge the causal relationships between the variables of PEB in PETD, detect the relationships between potential and observed variables such as NE, CA, awe, SA, SN, and PEB, and explain the statistical errors that may arise in the estimation and measurement process.

This study collected empirical data through a questionnaire survey. the research team sent the initial scale to tourism management experts and experts with travel experience in PETD for review and optimized the initial scale according to their feedback to improve the operability of the questionnaire. The questionnaire consists of three parts: the first part, in order to distinguish local residents and tourists, set "Are you a tourist of Shangri-La, have you visited the Shudu Lake, the Dukezong ancient town, the Napa Lake, and the Songzanlin temple" to ensure the identity of the respondents. The second part collects social and demographic data, including permanent residence, household registration type, gender, age, education, occupation, monthly income, religious belief, and the number of visits to Shangri-La. The third part consists of six measurement scales, the NE and CA were selected from those used in Keltner's (Keltner & Haidt, 2003), Tian (Tian et al., 2015b) and Qi (Qi et al., 2018) study on the evaluation of the perception of NE and CA (e.g., Magnificent, strong, magically beautiful, majestic and unexpected; Solemnity, seriousness, unlimited, gorgeous, beautiful and magical); the items for awe were based on those used in Coghlan's (Coghlan et al., 2012), Tian (Tian et al., 2015a) and Qi (Qi et al., 2018) exploration of the dimensions of awe (e.g., Exciting, unusual, humbling, unexpected); the items for measuring SA were derived from Wang (Wang et al., 2019), Godin (Godin & Kok, 1996), Chen (Chen & Chao, 2011), Ajzen (Ajzen, 1991), Brown (Brown et al., 2010)'s study (e.g., It is worthwhile to protect the environment of tourist site; It is good to protect the environment of tourist site; It is worthwhile to protect the environment of tourist site); the items measuring SN were mainly derived from Wang (Wang et al., 2019), Heesup (Heesup et al., 2018), Van (Van Riper, Kyle (2014)), Brown (Brown et al., 2010) and Miller (Miller et al., 2015)'s study (e.g., Most people who are important to me think I should protect the environment of the scenic spot; People who I respect hope I can protect the environment; People I am familiar with will take part in the protection of the environment of tourist site); and the items measuring PEB were modified on the basis of the scale used by Wang (Wang et al., 2019), Cheng (Cheng et al., 2013), Ajzen (Ajzen, 1991), Miller (Miller et al., 2015) and Untaru (Untaru et al., 2014) to study the influencing factors of tourists' PEB (e.g., I am willing to follow the tourism regulations of the administration of the scenic spot; I am willing to follow the tourism regulations of the administration of the scenic spot; I am willing to discourage others from damaging the scenic spot) (Table 2).

Since the subjects of the study were mainly Chinese, two tourism scholars with bilingual backgrounds were invited to translate the measurement scale into Chinese and then into English, two other Chinese researchers proofread the scale to verify consistency and improve the readability of the questionnaire by modifying part of the wording. The five-point Likert was used for variable measurement of all measurement items (1 for "strongly disagree", 2 for "disagree", 3 for "neutral", 4 for "agree", and 5 for "strongly agree").

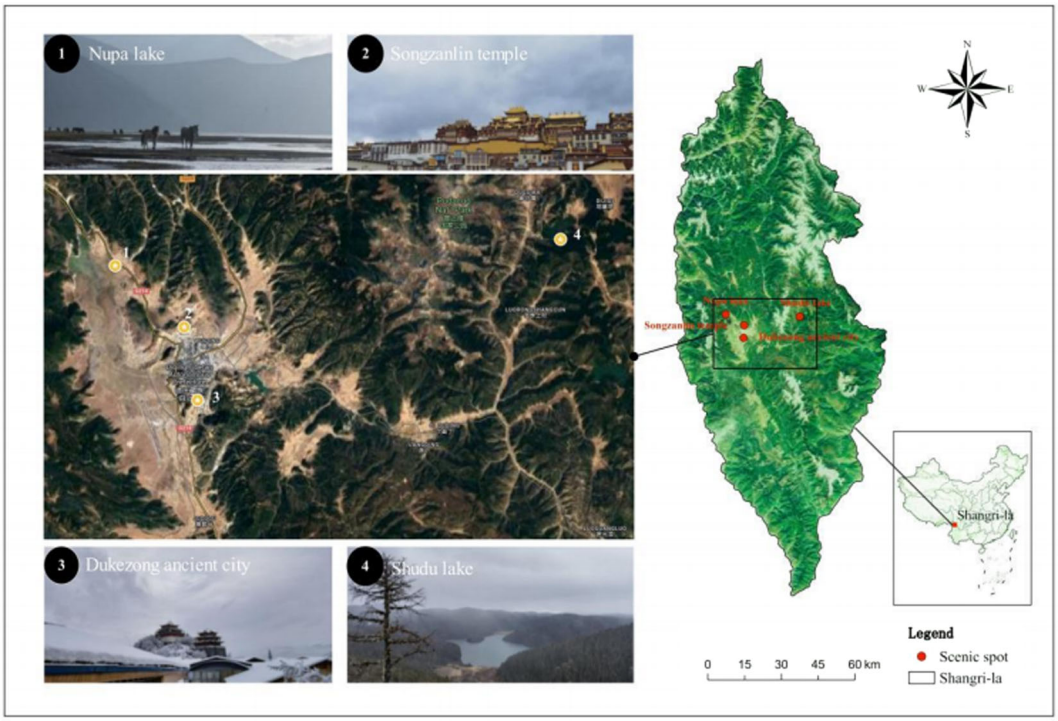

Fig. 2 Map of the research area. In the figure, the lower right corner is the map of China, and the red dot is the location of Shangri-La in the map of China. In the middle is the topographic map of Shangri-La, and the four red dots are the four scenic spots investigated in this study. On the left are topographic maps and actual scenes of the locations of the four scenic spots.

Sampling and data preprocessing. As the Shudu Lake, the Dukezong ancient town, the Napa Lake, and the Songzanlin temple are the most representative places in Shangri-La with a large number of tourists, therefore, the sample frame consisted of Shangri-La tourists who had visited the four sites mentioned above. Since the research team could not obtain a list of all the tourists, the systematic sampling approach was chosen. The research team is experienced and systematically trained to explain every question about the questionnaire for the respondents, and when the respondents encounter language or understanding difficulties in the questionnaire, the researchers will help with translation and interpretation. In order to increase the representativeness of the sample, systematic random sampling technique was adopted, one of every five tourists was randomly selected to visit, and only one representative was invited to participate in the team. Before the respondents filled in the questionnaire, the researchers confirmed that they had travel experience in the four places mentioned above, then briefed the respondents about the purpose of the study, voluntary and anonymous, asked them about their willingness to participate in the survey. If the respondent refuses, the next tourist will be invited to participate, and the respondent is informed in advance that they will get a small gift as a reward after completing the questionnaire to improve the quality of the data.

The investigation task is divided into two stages: pre-investigation and formal investigation. Pre-research phase, the research team conducted pre-survey and questionnaire optimization from October 21 to October 25, 2021. The questionnaire originators asked the pre-survey subjects about the unclear and ambiguous places in the questionnaire, and a total of 112 valid pre-survey questionnaires were collected. Then, the initial scale items were further purified with the help of principal component analysis, and items that did not meet the requirements were deleted according to the following criteria: First, items with a single factor load less than 0.5; Second, items with loads greater than 0.4 on multiple factors; Third, items with negative contribution to Cronbach's α value; Fourth, for the items whose overall correlation coefficient is less than 0.5 after modification, the final optimized scale includes 18 items (Table 2). In the formal investigation stage, considering the timeliness of the questionnaire and the uncertainty of the COVID-19 control policy at that time, the research team chose the window period when the control was relaxed to conduct field investigation. The research team conducted two rounds of fieldwork from March 28 to April 10, 2022, and November 25 to December 5, 2022, at four of the most representative locations in Shudu Lake, Dukezong Ancient City, Nupa Lake and Songzanlin Temple. A total of 600 questionnaires were distributed in the two sessions, 535 were completed and recovered, of which 19 were excluded due to incomplete completion, resulting in 516 valid questionnaires, a questionnaire recovery rate of 89.3%, and a validity rate of 86%. The ratio of the number of valid questionnaires to the number of questions was 1:28.7.

Results

Profile of Respondents. The descriptive statistical information of the field research sample truly reflects tourists' demographic characteristics of Shangri-La (Table 1). Among the respondents, one-fourth of the respondents were from within Yunnan Province and three-fourths were from outside the province; nearly one-third of the respondents were of rural household registration and two-thirds were of urban household registration. The number of male and female respondents is roughly equal, with a balanced distribution; 79% of visitors are between 16–44 years old, and especially 65% are between 25–44 years old, indicating that middle-aged and young people are the main tourists in Shangri-La. Among them, 62.88% of the respondents held a college degree or a bachelor's degree or above, with more than half of the tourists having a high level of education; 85% of the respondents

Table 1 Descriptive statistical analysis.

Variable	Category	Percentage(%)	Variable	Category	Percentage(%)
Place of permanent residence	Within Yunnan Province	25.38	How many times have you come to Shangri-La	1 time	62.19
	Outside Yunnan Province	74.62		2 times	24.57
Household registration	Rural	32.84		3 times and above	13.23
	Urban	67.16	Monthly personal income(yuan)	3000 and below	10.17
Gender	Male	51.31		3001–5000	23.73
	Female	48.69		5001–7000	31.26
Age	16–24 years old	13.98		7001–9000	34.84
	25–44 years old	65.05		9000 and above	14.31
	45–64 years old	19.42	Occupation	student	9.36
	65 years old and older	1.40		Government staff	2.06
Education	Junior high school and below	7.77		public institutions staff	3.75
	High school	29.36		Private business owners	30.90
	College or bachelor	52.08		Enterprise employee	14.79
	Graduate and above	10.80		Freelancer	23.60
Religious affiliation	Yes	14.31		Retirees	5.24
	None	85.69		Farmer	2.25
				Others	8.05

do not have any religious beliefs. 62.19% of the respondents were visiting Shangri-La for the first time, 24.57% for the second time, and 13.23% for three times or more, indicating that Shangri-La had a high proportion of first-time visitors and a large number of potential tourists. 80.42% of the respondents had a monthly income of more than 5,000, which indicated that most tourists had a higher level of consumption and ability to pay. Among the respondents, the proportions of self-employed, freelancers and enterprise staff were higher, respectively: 30.9%, 23.6% and 14.79%, while the proportions of other occupation types were relatively small.

Confirmatory factor analysis. Firstly this study uses the Harman one-way test to test the data for common method bias (CMB). The results show that the overall variance explained by the first factor was 32.37%, which was lower than 50% (Podsakoff & Organ, 1986), implying that CMB was probably not problematic. The skewness values for items were between −1.19 and −0.08 with an absolute value of <3, and kurtosis scores were between −1.13 and 1.17with an absolute value of <7, indicating the data had a normal distribution as required for the use of covariance-based structural equation modeling. The above results show that the research data in this study conforms to a normal distribution and can be further analyzed using AMOS software.

Using SPSS27.0 software for reliability and validity analysis, the calculation results show that the Cronbach's value is 0.875, indicating that the model has high reliability and good internal consistency; the value of KMO statistic is 0.866, indicating that there is a strong correlation between the question items; the value of the Bartlett's spherical test is equal to 3286.264, which reaches a significant level under the degree of freedom of 153 and at the 0.000 level of significance, indicating that there is a significant difference between the correlation coefficient matrices of the 18 items in the measurement model, which makes it suitable for validation factor analysis.

AMOS26.0 software was used to further test the fitting effect and reliability of the measurement model. First of all, the absolute fitness index, value-added fitness index and reduced fitness index test are chosen to evaluate the fitting model, the absolute fitness index is 2.873, which is between 1–3, the values of GFI are all greater than 0.9, and the RMSEA and RMR are 0.06 and 0.019 respectively, which are in the ideal values; the value-added fitness indexes of TLI, CFI, and IFI are greater than 0.9, which reaches the ideal value standard; the reduced fitness indexs of PNFI and PGFI are greater than 0.6, satisfying the ideal standard of greater than 0.5 (Chin and Todd, 1995).

A confirmatory factor analysis was conducted using the great likelihood estimation method to test the factor loadings and convergent validity of the whole and each subscale, and the average variance extraction (AVE) and combined reliability (CR) were used to test the convergent validity (Table 2). In particular, the standardized coefficients for each measurement question item ranged from 0.565–0.803, which were all greater than the critical threshold of 0.5 (Tracey et al., 1999) for standardized factor loadings; the combined reliability (CR) values of the constructs ranged from 0.726–0.777, which were all higher than the critical threshold of 0.7 (Fornell and Larcker, 1981); and the average variance extraction (AVE) values of the constructs ranged from 0.470–0.538, and the NE, SA and PEB were very close to the standard of 0.5, which was in the acceptable range and had good convergence validity.

The discriminant validity between the constructs was examined (Table 3). It is generally believed that when the square of the correlation coefficient between various constructs is smaller than the average extraction variance of each construct, it indicates that the discriminant validity is ideal. As can be seen from Table 3, except for the correlation coefficients of NE and CA, which were slightly higher, the square root of the AVE of all the other constructs was significantly greater than the correlation coefficients of the constructs, indicating that the scale has a good discriminant validity.

Structural modeling tests. The fitting statistics of the structural equation model in this study are: $x^2/df = 2.956$, IFI = 0.924, CFI = 0.924, PGFI = 0.749, NFI = 0.89, RMSEA = 0.062, RMR = 0.022. Therefore, the fitting statistics of the model are acceptable.

AMOS 26.0 software was used to test H1-H7 through SEM method, and the results are shown in Fig. 3 and Table 4, both of NE and CA have a significant positive effect on tourists' awe, and H1 and H2 are supported. Tourists' awe has a significant positive effect on their SA and SN, and H3 and H4 are

Table 2 The results of confirmatory factor analysis.

Research constructs and measurement items	Parameter significance estimation			Item reliability		combined reliability	convergence validity
	uStd.	S.E.	t-value	Std.	SMC	CR	AVE
NE						0.745	0.494
Shangri-La's nature is powerful	1			0.738	0.455		
Shangri-La's nature is pristine	0.913	0.072	12.695***	0.646	0.583		
I want to remain humble in the face of Shangri-La's nature	0.953	0.071	13.401***	0.721	0.480		
CA						0.762	0.517
The power of Shangri-La's local culture is limitless	1			0.701	0.509		
Shangri-La's local culture is solemn and sacred	1.039	0.078	13.285***	0.704	0.504		
Shangri-La's local culture is splendor and subtlety.	1.081	0.078	13.79***	0.75	0.438		
Awe						0.763	0.518
I feel excited about traveling to Shangri-La	1			0.712	0.493		
I feel unforgettable about traveling to Shangri-La	1.012	0.066	15.364***	0.69	0.524		
I feel humbled about traveling to Shangri-La	1.188	0.091	13.08***	0.755	0.430		
SA						0.726	0.474
Protecting Shangri-La's environment is beneficial	1			0.803	0.355		
Protecting Shangri-La's environment is acceptable.	0.788	0.075	10.513***	0.677	0.542		
Protecting Shangri-La's environment is worthwhile	0.729	0.075	9.76***	0.565	0.681		
SN						0.777	0.538
People who are important to me think I should protect Shangri-La's environment.	1			0.745	0.445		
People I respect want me to protect the environment in Shangri-La	0.895	0.07	12.831***	0.686	0.529		
People I know well want me to protect Shangri-La's environment	1.099	0.076	14.414***	0.767	0.412		
PEB						0.726	0.470
I am willing to pay attention to Shangri-La's environmental protection knowledge (e.g., signage, environmental explanations, brochures, books, TV programs, etc.)	1			0.728	0.470		
I am willing to protect Shangri-La's landscapes, facilities and environment from damage.	0.894	0.081	11.057***	0.703	0.506		
I am willing to discourage others from damaging Shangri-La's environment.	0.847	0.076	11.077***	0.621	0.614		

***$P < 0.001$.

Table 3 The results of discriminant validity test.

Variable	NE	CA	awe	SA	SN	PEB
NE	**0.703**					
CA	0.713	**0.719**				
awe	0.596	0.703	**0.720**			
SA	0.345	0.399	0.559	**0.689**		
SN	0.505	0.372	0.451	0.386	**0.733**	
PEB	0.389	0.388	0.598	0.619	0.461	**0.686**

The values on the diagonal, that is, the bold values, are the square root of the convergence validity (AVE) of the constructs, and the values below the diagonal, that is, the non-bold values, are the correlation coefficients between constructs.

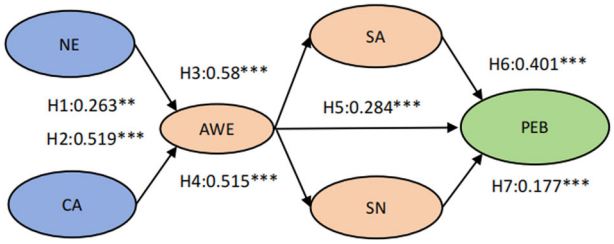

Fig. 3 Structural model results. In the figure, H1-H7 represent seven influence paths respectively, seven values represent the standardized coefficient of the influence paths, *** represents $p < 0.001$, ** represents $p < 0.01$, when $p < 0.05$, the influence path is supported, otherwise it is not supported.

supported. Tourists' awe has a significant positive effect on their PEB, H5 is supported. Tourists' SA and SN have a significant positive effect on their PEB, H6 and H7 are also supported. Therefore, the hypotheses of H1-H7 are all valid after testing.

Mediating effect test. Using Bootstrapping mediating effects test, the sampling was repeated 2000 times to calculate the significance of the three mediating effects of awe, SA and CA under the 95% confidence interval, respectively. The results are shown in Table 5. First, the confidence intervals for the total and direct effects of awe → PEB are 0.531–0.837 and 0.103–0.547, respectively, and the confidence intervals for the indirect effects of awe → SA → PEB and awe → SN → PEB are 0.154–0.405 and 0.022–0.215, respectively. The total effect, direct effect and indirect effect were all inclusive of 0. This shows that SA and SN play a partially mediating effect between awe and PEB, and H8 and H9 are supported.

Second, the confidence intervals for the indirect mediating effects of NE → awe → PEB and CA → awe → PEB were 0.02–0.191 and 0.052–0.29, respectively, and neither of the two indirect mediating effects contained 0. Meanwhile, the confidence intervals for the NE → awe → SA → PEB, 0.018–0.144, the confidence intervals for the NE → awe → SN → PEB confidence interval, 0.005–0.077, CA → awe → SA → PEB confidence interval,0.065–0.209, and CA → awe → SN → PEB confidence interval,0.01–0.104, none of the four chain-mediating effects contain 0, which shows that awe, SA and SN play chain-

Table 4 The results of hypotheses.

Hypothesis	Influence path	Unstandardized coefficients	Standardized coefficients	Measurement error variance	Combined reliability	p	Combined reliability
H1	NE → AWE	0.23	0.263	0.075	3.065	0.002	Supported
H2	CA → AWE	0.462	0.519	0.083	5.585	***	Supported
H3	AWE → SA	0.627	0.58	0.067	9.295	***	Supported
H4	AWE → SN	0.622	0.515	0.076	8.187	***	Supported
H5	AWE → PEB	0.325	0.284	0.093	3.51	***	Supported
H6	SA → PEB	0.425	0.401	0.082	5.157	***	Supported
H7	SN → PEB	0.168	0.177	0.06	2.819	0.005	Supported

***$P < 0.001$.

Table 5 Mediation effect test.

Effect	Path	effect value	standard error	confidence interval		p
				Lower	Upper	
Total effect	AWE → PEB	0.696	0.089	0.531	0.873	0.001
Direct effect	AWE → PEB	0.325	0.113	0.103	0.547	0.003
Indirect effect	AWE → SA → PEB	0.266	0.066	0.154	0.405	0.001
	AWE → SN → PEB	0.104	0.049	0.022	0.215	0.015
Total effect	NE → PEB	0.16	0.066	0.046	0.308	0.004
	CA → PEB	0.322	0.069	0.193	0.464	0.001
Indirect effect	NE → AWE → PEB	0.075	0.039	0.02	0.191	0.002
	CA → AWE → PEB	0.15	0.06	0.052	0.29	0.002
	NE → AWE → SA → PEB	0.061	0.029	0.018	0.144	0.003
	NE → AWE → SN → PEB	0.024	0.016	0.005	0.077	0.008
	CA → AWE → SA → PEB	0.123	0.036	0.065	0.209	0.001
	CA → AWE → SN → PEB	0.048	0.024	0.01	0.104	0.014

mediating roles in the effects of NE and CA on PEB, and H10, H11, H12, and H13 are supported.

Discussion

The innovation and practicality of the scale. Based on the context and theoretical model of Shangri-La Plateau ecotourism, this scale breaks through the limitations of the traditional scale in systematic and holistic analysis, and innovatively constructs a tourist PEB scale with three dimensions of "contextual stimulation, psychological effect and behavior execution". Especially for the presentation of the special context of the PETD, the high altitude and large drop of the plateau have formed the landform features of vertical and horizontal gullies, strong cuts, and diverse types and remarkable three-dimensional climate zone spectrum, a complete vertical ecosystem, breeding diverse biota and local cultural heritage, and forming the unique characteristics of the PETD.

The lake-type tourism context mainly displays water resources (Li et al., 2019), birds and other resources, wetland tourism context mainly include water and aquatic plants (Li et al., 2019), birds, beaches and other resources (Wang & Li, 2018), forest park-type tourism context mainly integrate forest vegetation, geological landforms and other resources. The above three tourism contexts mostly use single category of natural ornamental tourism resources to stimulate tourists' perception. According to the results of this study, the factors that trigger tourists' psychological changes in the context of PETD can be summarized as: the dual perception of plateau as an ecological, sacred, venerated natural and cultural landscape defines what distinguishes it from other ecotourism destinations.

Although the mountain tourism context includes the dual tourism resources such as strange peaks and rocks, cloud sea waterfall, animal vegetation, religious culture, historical relics and folk customs, but in terms of landscape shock, rarity, size and rich diversity, the plateau has the natural landscape of giant peaks and valleys, rare animals and plants, vast grasslands, pure lakes, and cultural landscape of mysterious religions, colorful folk customs, nomadic culture, and cultural classics, which brings tourists a double perception with a stronger impact.

According to the measurement results of this study scale, the two contextual factors of NE and CA successfully arouse awe of tourists on the plateau, which confirms Li's view that environmental heterogeneity brings positive emotions beyond the usual sense of satisfaction and pleasure to tourists (Li et al., 2022). However, some scholars believe that NE has a stronger effect on PEB of mountain tourists than CA (Qi et al., 2018). In contrast, this study confirms that CA is the primary factor among the multiple contextual factors of PETD, that is, the effect of tourists' perception of cultural atmosphere is stronger. This adds a new understanding of tourists' perceptions and psychological arousal factors and provides a reference for PETD to determine their core competitiveness.

Comprehensiveness and systematicness of psychological structure. This study expands the research scope of PEB under a synthetical psychological perspective, highly summarizes the psychological structure dimensions of PEB in rationality, morality, and emotion, and confirms the complex relationship between psychological factors and pro-environment behavior of plateau tourists. The three psychological factors of tourists' awe, SA and SN all directly and positively affect PEB, and tourists' awe has a very strong positive effect on SA and SN, and this view is deeply reflected in the existing relevant literature: many scholars have affirmed the positive effect of awe, SA and SN on PEB (Zelenski & Desrochers, 2021), tourists experiencing

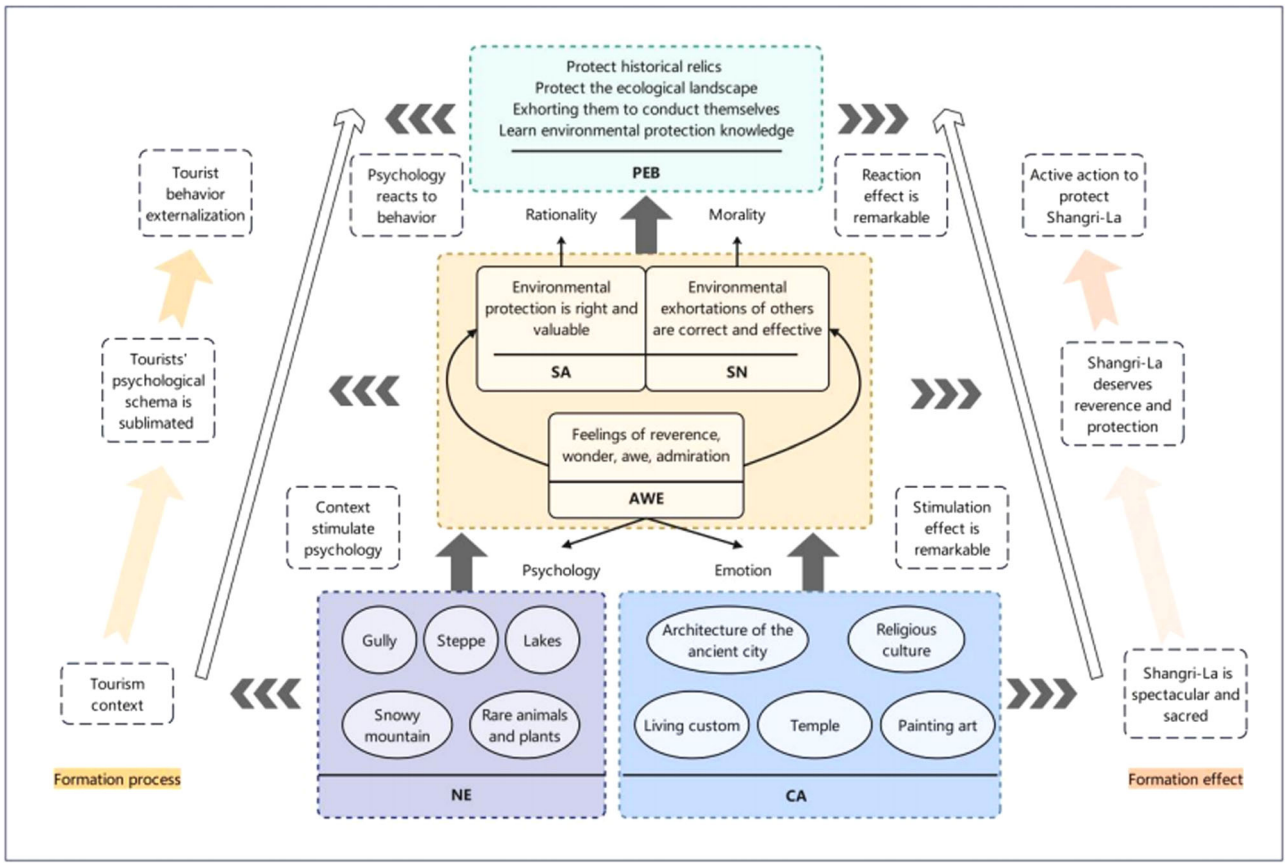

Fig. 4 Mechanism of tourists' pro-environment behavior. In the figure, the middle part innovatively sorts out the formation mechanism of tourists' pro-environment behaviors in plateau ecotourism destinations from the external context and internal psychology, that is, NE(natural environment) and CA(cultural atmosphere) tourists to change in AWE(awe), SA(self-attitude) and SN(subjective norms), and thus affect tourists' pro-environment behaviors. The left part summarizes the formation process of tourism context, psychological schema and behavior externalization. The right part summarizes the formation effect of Shangri-La context, tourists, and tourists' behaviors.

environmental awe would shift from simply focusing on themselves to the environment, thus changing their perceptions of environmental protection (Hicks, 2018). Tourists form normative moral judgments in tourist context, making tourists more willing to act responsibly in their mental representations (Robina-Ramírez & Pulido-Fernández, 2021). Specifically speaking, tourists to Shangri-La tend to have a kind of piety and pilgrimage psychology. The awe obtained by contextual awareness can awaken the original SA and SN of tourists, make it easier for tourists to have a sense of reverence and obedience, and strengthen the determination of environmental protection (Powell et al., (2012)).

The three psychological factors of tourists (awe, SA and SN) play a partial mediating role and a chain mediating role between contextual factors (NE and CA) and PEB. First of all, plateau tourists' awe is aroused most quickly after they perceive the stimulation of tourism context, and this conclusion is confirmed by Niu's research in Yuntai Mountain, which shows that tourists' perception and evaluation of NE and CA can positively influence their awe (Niu & Liu, 2022). Secondly, with the emergence of awe, the psychological schema of tourists is changed, and awe improves the environmental protection and moral cognition of tourists before arriving at the tourist destination. Powell's research also believes that awe can improve the SA and SN and other emotions of tourists when discussing the emotional judgment of tourists on the Antarctic tourism experience (Powell et al., (2012)). Finally, the three psychological factors all promote the development of tourists in the direction of PEB, and the stimulus effect and response effect are significant. Qi's study on Qianshan shows that psychological factors such as awe and expectant conscious emotion play an intermediary role between contextual factors and PEB (Qi et al., 2018).

Formation mechanism of tourists' pro-environment behavior. Based on the SOR and the extended TRA, this study innovatively clarifies the formation mechanism of tourists' PEB in PETD from the two pre-factors of external context and internal psychology. That is, tourists' PEB experiences the formation mechanism of "tourism contextual perception - sublimation of tourists' psychological schema - externalization of tourists' behavior". The above fills the gap in the research on the formation mechanism of tourists' PEB, opens up new ideas for theoretical research on tourists' PEB, and expands the theoretical basis for their practical development (Fig. 4).

NE and CA are the main components of tourism context, the PETD is a unique tourism context composed of natural landscapes such as snow-capped mountains, canyons, rare animals and plants, and cultural landscapes such as ethnic characteristics, religious culture, living customs. The impact and shock of the external context produce psychological identification and language exclamation (Cheng & Wu, 2015), and the tourists are shocked and convinced by the original ecology, magnificence, surprise, holiness and mystery of Shangri-La, and the marvel effect is very significant.

When tourists' psychology is stimulated by strong external context, their internal psychological schema is sublimated

(Keltner & Haidt, 2003), and awe is most easily triggered (Coghlan et al., 2012), thus awakening their environmental awareness (Wang et al., 2019) and recognition of others' environmental advice (Chen et al., 2021). After a series of complex psychological reactions, plateau tourists analyzed the result of "Shangri-La deserves respect and protection", that is, by comparing the original environmental awareness and experience, awakening and enriching environmental attitudes, deepening their trust in others' environmental advice.

Internal psychological motivation is the most direct driving force for behavior externalization and presentation (Lu et al., 2020), tourists' emotional, moral and rational factors all play an active role in responsible environmental behavior (Li et al., 2019), its PEB was transformed from internal into action, and tourists actively put into protecting Shangri-La's ecological landscape, historical relics and persuading others, and the effect of this reaction was very significant.

In summary, the formation mechanism of PEB of plateau tourists extends the three processes of "situation-perception-emotion" and the two stages of "external-internal" in tourists' physical and emotional interactions proposed by Song (Song et al., 2020) to PEB. It forms three forming processes of "contextual awareness - psychological sublimation—behavior externalization" and three developing stages of "external-internal-externalization".

Practical implications. The capital investment of environmental protection in PETD should be based on basic maintenance and protective development, enabling tourists to experience the pure snow and ice landscape, alpine lakes, etc., and be astonished by the pure and splendid religious books, local architecture, murals and carvings. Abstract concepts such as "pro-environment", "environmental protection" and "ecology" are concretized through image personification, and a set of environmental protection cartoon images of scenic spots such as "ancient city", "snow mountain" and "temple" are developed and designed to strengthen tourists' emotional awareness of environmental protection through visual stimulation of the marking system. Develop customized cultural experiences for tourists, deepen and extend the Shangri-La memory of tourists, and enhance awe and emotional cognition of tourists. Tourists can also participate in Shangri-La's environmental protection management, publicity and even the formulation of laws and regulations through regular and fixed-point lectures, performances, demonstrations and other diverse activities, or volunteer service experience.

For natural and cultural landscapes that are not readily visible and not open to the public, the emerging technologies such as virtual digital and artificial intelligence can be considered for display. Similarly, virtual simulation software can be utilized to simulate the activity space of various scenes, on-site interactive experience devices, auxiliary two-dimensional code explanation and short video forms to create the landscape experience of Shangri-La ecotourism resort, so that tourists can perceive the different results brought by different behaviors and truly comprehend the negative impact of environmental damage on the plateau tourism resort. To realize the education and guidance of tourists' PEB. At the same time, we will make full use of WeChat, Douyin and other information platforms to expand the environmental protection publicity of Shangri-La tourist destinations, and continue to extend the tourists' PEB.

Limitation. There are some limitations in this study. Firstly, this study conducted SEM with cross-sectional data from the field research, and the data relied on tourists' real and objective reports, but tourists' catering to social expectations because of "face psychology" would affect the test results. The follow-up research needs to be supplemented by auxiliary interview method and experimental method. Secondly, the ecotourism experience of Shangri-La in different seasons is quite different. Due to the impact of the epidemic, human and material resources, the research could not be conducted in different seasons and time periods. Future research should select the time with significant experience differences and conduct seasonal multi-time surveys. Third, there are a large number of ecotourism destinations on the plateau with large landscape differences, and the universality of the conclusion needs to be verified by additional case studies. In the future, the scope of research needs to be expanded to cover other ecotourism destinations on the plateau with large differences, and the scope of application of the formation mechanism of tourists' PEB should be expanded.

Conclusion

Under the guidance and deepening of SOR and extended TRA, this study analyzes and explains three main driving chains of tourists' PEB of in PETD under the synergistic effect of multiple pre-factors such as external context and internal psychological factors: NE/CA → awe → SA → PEB, NE/CA → awe → SN → PEB, NE/CA → awe → PEB. It is demonstrated in detail that psychological factors play a mediating role between the travel situation and PEB, in which awe plays a partial mediating role, and SA and SN play chain mediating roles.

The scale construction of this study presents the formation mechanism of PEB comprehensively and systematically and creates a new perspective and scale method for the study of PEB in the field of PETD. In view of the diversity of the PETD in terms of environment and culture, the uniqueness of the plateau geomorphic landscape, vertical climate characteristics, national characteristics and architectural styles is fully manifested, and the contextual perception of tourists toward PETD is quantified. The psychological consideration and dynamic change of tourists are highlighted, and the relationship of tourists' psychological factors and the sublimation process of the psychological schema is truly measured and captured.

This study puts forward the formation mechanism of tourists' PEB, which encompasses multiple dimensions (tourism context—psychological factors—PEB), three processes (contextual perception—psychological sublimation—behavior externalization), and three stages (external—internal—externalization). Particularly in the psychological dimension, the relationship between rational, moral and emotional psychological factors and their evocative effect on PEB are integrated and verified. This study confirmed the positive influence of awe on SN and SA through logical deduction and empirical testing. This undoubtedly provides a reference for the further exploration of the relationship among three psychological factors. That is, before the implementation of moral and rational behavior, the effect of the former two can be enhanced by improving the emotional tendency, and also complements the research results in the field of tourism regarding the post-awe factor of tourists and the arousal factor of PEB.

Data availability

The data used to support the findings of this study are available from the corresponding author upon request, and the data was uploaded to the open data repository of the journal and attached the dataset as a supplementary file to this submission.

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Author contributions

Lulu Wang: conceptualization, methodology, validation, writing-original draft, review & editing. Hu Yu: data curation, formal analysis, validation, writing-original draft, review & editing. Bin Zhou: validation, writing-review & editing.

Competing interests

The authors declare no competing interests.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The ethics approval was obtained from the institutional review board (IRB) of Institute of Geographic Sciences and Natural Resources Research on Sep 12, 2021, with the following ID number: DLS202–405. The Institute of Geographic Sciences and Natural Resources Research Ethics Committee reviewed and approved the study protocol, involving research design and methods, recruitment approach for participants, data collection and privacy protection, and informed consent. All questionnaires were obtained by considering the informed consent of the participants, and all participants completed it voluntarily and anonymously.

Informed consent

Informed consent was obtained from all participants in this study prior to their completion of the study. Within the scope of this study, written informed consent was obtained from all participants. Participants were given detailed written and verbal information about the purpose, scope, method and possible risks of the study. Participants signed consent forms indicating that they voluntarily participated in the study, agreed to use the collected data for scientific purposes and to publish the results anonymously. Informed consent was obtained and recorded by the researcher (Hu Yu), involving a total of 516 participants, of which 108 participants signed informed consents between October 21, 2021, and October 25, 2021, 285 participants signed informed consents between March 28, 2022, and April 10, 2022, and 123 participants signed informed consent forms between November 25 and December 5, 2022. Participants in this study do not involve special groups and vulnerable individuals such as children, patients, refugees. No payment was made to the participants for their participation in the study. All participants were assured in writing that the information they provided would be kept confidential, their personal data would be protected, and the results of the research would only be reported anonymously. Participants were informed that they had the right to withdraw from the study at any time and were assured that their data would be destroyed in this case.

Additional information

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Correspondence and requests for materials should be addressed to Hu Yu.