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Research paper

Determinants and mechanisms driving energy-saving behaviours of long-stay hotel guests: Comparison of leisure, business and extended-stay residential cases

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ABSTRACT

The global hospitality industry is fast-turning sustainable and environmentally friendly. Behaviour-driven energy conservation is an emerging green hotel operation strategy to support this change. The long-stay accommodation services have gained momentum in the hospitality sector since the COVID-19 pandemic. However, the characteristics of long-stay hotel guests are often overlooked in sustainable interventions. Based on an empirical survey in China, this study aims to explore the factors driving energy-saving behaviours of long-stay hotel guests and to compare their effects on guests for different visiting purposes (leisure, business, and extended-stay resident). The analysis indicates that attitude, personal norm and place attachment present a direct contribution to energy-saving behaviour. Besides, the results support that attitude and personal norm connect environmental values and energy-saving behaviour. Both altruistic and biospheric values have positive effects, while egoistic values seem to play a negative role. Biospheric values have stronger impact on attitude and personal norm of business guests. Place attachment has a stronger influence on extended-stay residents while its contribution to energy-saving behaviours of business guests is smaller than other guests. Besides, leisure guests are more sensitive to moral obligations. This research sheds novel lights on the psychological perspectives of the observed heterogeneity of energy-saving behaviours of hotel guests with different visiting purposes. The findings provide hotel operators with a novel theoretical reference for targeted energy-saving interventions to promote energy-saving actions of long-term hotel guests. The study, therefore, can contribute to sustainable tourism policymaking and behaviour-driven hotel energy management.

1. Introduction

Energy issues are emerging as critical challenges in the accommodation services industry. The British hospitality sector occupies 0.6% (1.29 Mtoe) of national energy consumption, doubling from 0.3% (0.72 Mtoe) in 1990 (Energy & Environment Alliance, 2020). The accommodation service is also listed as one of the three worst-performing industries in energy intensity since 1990. Due to rapidly evolving demands, the hospitality and tourism sector is turning energy-intensive, predicted to double its consumption by 2050 (Gössling, 2013; Gössling and Peeters, 2015). Energy overuse and carbon emission can decrease the attractiveness of tourist destinations, with long-term damage to the development of the hospitality industry (Deng et al., 2017; Hu and Wall, 2005). Besides, energy costs have been a fast-growing burden on the hospitality sector (Energy & Environment Alliance, 2020). American hotels annually spend $2196 on energy per available guest room on average (Environment Protection Agency, 2016), and the cost continues to rise with unit electricity prices. Thus, energy management is gaining priority in hotel business strategies for sustainable operation and management.

In addition to energy-efficient building techniques, reducing energy use by enhancing energy-saving behaviours of guests is a cost-effective energy conservation solution in hotel operation (Filimonau and Magklaropoulou, 2020; Kim et al., 2019). Several studies have reported effective energy-saving behavioural interventions in residential, office, and community cases (Iweka

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et al., 2019; Xu et al., 2021, 2023) and indicated a 20% resource-saving potential in tourism (Warren and Becken, 2017). Therefore, academia has paid more attention to behaviour-driven energy conservation strategies in hospitality (Filimonau and Magklaropoulou, 2020; Wang et al., 2021a). However, there are many challenges in applying community experience in the hotel energy management context. First, hotel stays have a stronger hedonic nature (Miao and Wei, 2013; Palani and Karatas, 2022). Personal/family interest and attachment are critical drivers of community pro-environmental behaviours (Liu et al., 2020; Zhang et al., 2014), while these factors usually play less important roles in hotels (Palani and Karatas, 2022). Second, guests often present heterogeneous behavioural patterns during their hotel stays (Palani and Karatas, 2022). Therefore, hoteliers should formulate specific interventions and incentives according to the characteristics of different guests.

Some hotels developed over-two-week long-stay products with flexible rental periods, competitive rates and essential services, such as laundry and cleaning (Shokoohyar et al., 2020). During the COVID-19 pandemic, the long-stay service has gained momentum and contributed to maintaining the occupancy rates of hotels. In addition to guests for tourism and business purposes, long-stay accommodation services also attract local residents for extended-stay hotel home (Lewinson, 2010; Lewinson and Collard, 2012). In contrast to a home environment, long-stay customers are less likely to pay for energy/water bills and have no ownership of the property/facilities. However, compared to ordinary hotel guests, long-stay guests consider more the impact of their behaviours on their living environment and perform better in pro-environmental behaviours, such as water conservation, which reflect their attachment to hotel (Gabarda-Mallorquí et al., 2021). Although long-stay guests show energy-saving potential, existing research has rarely focused on energy-saving behaviours of this type of customer.

Some studies on sustainable decision-making provide references for exploring the drivers and mechanisms of energy-saving behaviours in hotels. A widely discussed determinant values, including the value that are relevant to individual's interest (i.e., self-enhancement values) (De Groot and Steg, 2008; Li et al., 2022b) and individual's critical consideration of the mutual benefit of the society (i.e., self-transcendent values) (Steg et al., 2014a). Also, several hospitality management studies claim that attitude and personal norm are also important drivers of pro-environmental behaviours of guests (Foroughi et al., 2022; Han et al., 2010). Besides, environmental and place attachment deserves significant attention as it acts as an important issue in hotel guests' behavioural patterns (Prayag and Lee, 2019). Values refer to relatively stable principles and standards for behaviour and outcomes. Values can influence important factors that drive behaviour, such as people's attitudes towards behaviour and perceptions of information and the environment. Understanding the role of values is not only necessary to predict and explain environmental behaviours but can also help develop more effective behavioural interventions. For example, people give priority to information and matters that align with their values, which in turn affects their perceptions and behaviours. However, there are only a few studies that explain the psychological drivers of hotel pro-environmental behaviour from the perspective of values. In addition, a sense of belonging is also an important determinant of driving environmental behaviour. Attachment to an environment or community promotes residents to engage in sustainable behaviours that benefit the community environment. In hotels, long-stay guests may develop a stronger place attachment which may benefit the hotel operation. However, most of the previous research overlooked the role of place attachment in pro-environmental behaviours of hotel guests. Although these factors have been reported sporadically in the literature, their compound interactions and combined effects on the hotel context require further research.

The behavioural heterogeneity of guests is a critical challenge to behaviour-driven energy-saving strategies in hotels (Palani and Karatas, 2022). Therefore, it is necessary for both the academia and the hospitality industry to reveal the drivers and the mechanism of such heterogeneity. The aim of this study is (1) to explore the psychological factors driving energy conservation behaviours of long-stay hotel guests, and (2) to reveal their effect on guests with different hotel visiting purposes. This study sheds new light on sustainable hotel operations and management by providing valuable insights into the energy-saving behaviour of long-stay guests, an often-overlooked hotel customer group in previous studies. This paper, together with previous research focusing on ordinary guests, provides empirical references for formulating targeted energy-saving interventions and behaviour-driven energy management strategies in hotels.

The structure of this paper is outlined as follows: Section 2 reviews relevant literature and develops the conceptual framework. Section 3 describes the questionnaire design, the data collection process, as well as the data analysis method in this study. Section 4 presents the data analysis and results, and Section 5 first discusses the results, then highlights the implications, and sketches further directions and limitations. The last section draws the conclusion.

2. Literature review

2.1. Environmental values

Values refer to an individual's principles of ideal behaviour tendencies and outcomes (Feather, 1995; Rokeach, 1973). This item reflects the overarching goals that are subjectively important in life in general (Steg et al., 2014b), and therefore is critical in understanding attitudes, decision-makings and behaviours (Rokeach, 1973). Values can influence the cognitive process and contribute to intention and behaviours (Sargisson et al., 2020; Stern and Dietz, 1994). For example, people hold a more positive attitude towards behaviours that conform to their values, and preferences for the behaviours can motivate their practical actions. Therefore, environmental scientists have paid attention to the direct and indirect roles of values, especially those related to environmental protection behaviours (Ateş, 2020; Li et al., 2021, 2022a; Verma et al., 2019). Environmental values refer to behavioural standards related to environmental protection and environmental obligations (Dietz et al., 2005; Li et al., 2021; McMillan et al., 2004). Stern and Dietz (1994) proposed three important dimensions of environmental values: egoistic values, altruistic values and biospheric values. Egoistic values drive the individual to conserve or increase personal resources and personal benefit. Altruistic values reflect an individual's concern for the interests and well-being of others. Biospheric values reflect standards for nature and environmental protection.

These environmental values are interconnected: all three factors participate in the decision-making processes (Dietz et al., 2005). In pro-environmental behaviour, egoistic values guide individuals to make decisions in terms of personal interests or resources. There are several studies suggesting that egoistic values play a negative role in environmental protection (Li et al., 2021; Nguyen et al., 2017; Tamar et al., 2020). For example, residents with strong egoistic values are more inclined towards nuclear energy rather than renewable energy resources (Perlaviciute and Steg, 2015). However, many studies have also reported some opposite observations (Kim and Seock, 2019; Prakash et al., 2019). Verma et al. (2019), for example, found a positive correlation

between egoistic values and attitude towards green hotel visiting. Egoistic values may enhance positive perceptions of convenience and economic benefits of pro-environmental behaviours, which is supported by Kim and Seock (2019) and Nguyen et al. (2017). Altruistic values initiate people to think about environmental protection in the interest of others or society as a whole. Biospheric values guide people to understand pro-environmental behaviour from an environmental and natural perspective. People with strong biospheric values often present persistent pro-environmental preferences (Steg et al., 2014a). Most studies report that altruistic values and biospheric values play a positive role in typical pro-environmental behaviours, including green product purchases (Li et al., 2021) and energy saving (Wang et al., 2018).

2.2. Energy-saving attitude

Attitude refers to an individual's subjective evaluation of a specific behaviour (Bissing-Olson et al., 2013; Gatersleben et al., 2014; Liu et al., 2021a). Attitude directly reflects the behavioural preference and then contributes to behavioural intention and practical actions. Homer and Kahle (1988) propounded the Value-Attitude-Behaviour (VAB) model. This model suggests that values are critical determinants of pro-environmental attitudes and in turn reflects in pro-environmental behaviours (Homer and Kahle, 1988). Following the VAB theory and environmental value theory, several empirical studies have supported the significant impact of values and attitude and stated that values can well-explain changes in attitudes (Ateş, 2020; Prakash et al., 2019; Shin et al., 2018; Wang et al., 2018). Shin et al. (2018) state that biospheric values is the determinant of guests' attitude towards organic food. Prakash et al. (2019) also report that both altruistic values and egoistic values positively and significantly contribute to attitude towards purchasing eco-friendly packed products. Verma et al. (2019) all three environmental values are positively correlated to attitudes towards green hotel visiting. Wang et al. (2018) believe that only altruistic values drive residents' attitude to household energy conservation. There are some works, however, that found an insignificant correlation between values and attitudes towards pro-environmental behaviours (e.g., Liu et al., 2021b).

Besides, numerous empirical studies have reported the direct effect of attitudes on pro-environmental intentions and behaviours, including at-home energy conservation (Liu et al., 2021a; Wang et al., 2021b), electric vehicle adoption (Shalender and Sharma, 2021), energy-efficient equipment purchase (Lundheim et al., 2021), and campus recycling behaviour (Largo-Wight et al., 2012). However, some researchers argue that practical pro-environmental actions do not fully reflect attitudes (Tölkes, 2020; Wiederhold and Martinez, 2018). The inconsistency between attitude and actual action is known as the attitude-behaviour gap. This phenomenon has been reported in several typical sustainable behaviours, such as green clothing purchases (Wiederhold and Martinez, 2018), and sustainable travel behaviour (Tölkes, 2020). However, there is only a limited number of previous studies discussing the roles of environmental values in hotel energy-saving attitude. Based on the above discussion, this study puts forwards the following hypotheses:

H1. Altruistic values have a significant and positive influence on attitude of long-stay hotel guests.

H2. Egoistic values have a significant and negative influence on attitude of long-stay hotel guests.

H3. Biospheric values have a significant and positive influence on attitude of long-stay hotel guests.

H4. Attitude has a significant and positive influence on energy-saving behaviour of long-stay hotel guests.

2.3. Personal norms

Personal Norm is a feeling of moral obligation to perform a specific behaviour or make a decision (Schwartz, 1977; Schwartz and Howard, 1981). Personal norm is also called moral norm and moral obligation (Han and Hyun, 2018; Liu et al., 2021a). Personal norm is associated with self-expectation (Han et al., 2018a) and drives an internal motivation for an action (Schwartz, 1977). Several empirical studies are reporting the critical role of personal norm in pro-environmental studies (Ateş, 2020; Han et al., 2018b; Han and Hyun, 2018; Li et al., 2022b; Zhang et al., 2014). In particular, values might be an important determinant of personal norm. According to Schwartz (1977)'s Norm Activation Model (NAM), personal norm reflects internalised values and engage in decision-making process as moral obligations. Another important psychological model, Value-Belief-Norm (VBN) also defines that moral norm is derived from values. However, several empirical studies suggest that the nature of behaviour (Steg et al., 2014a) and culture (De Groot and Steg, 2007) can influence the direct correlation between environmental values and personal norms. For example, Kim and Seock (2019) and Prakash et al. (2019) reported that both altruistic values and egoistic values are positively correlated to personal norm towards green product purchase. However, another study found the impacts of altruistic and biospheric values are positive while the correlation between egoistic values and personal norm is negative. In addition, personal norms can have a direct influence on pro-environmental intention and behaviours. Some studies have found a positive correlation between personal norms and typical pro-environmental behaviours, such as green hotel visiting (Verma et al., 2019) and hotel recycling and water conservation (Han et al., 2018a). This study, therefore, proposes the following hypotheses:

H5. Altruistic values have a significant and positive influence on personal norm towards energy-saving behaviours of long-stay hotel guests.

H6. Egoistic values have a significant and positive influence on personal norm towards energy-saving behaviours of long-stay hotel guests.

H7. Biospheric values have a significant and positive influence on personal norm towards energy-saving behaviours of long-stay hotel guests.

H8. Personal norm as a significant and positive influence on energy-saving behaviours of long-stay hotel guests.

2.4. Place attachment

Place attachment refers to "the bonding between individuals and their meaningful environments" (Giuliani, 2003), covering three dimensions: person, process, and place (Scannell and Gifford, 2010a). The person dimension delineates the attached individual and collective people in the environment. The process dimension relies on the affective, cognitive and behavioural sides. The place dimension addresses the physical and social attributes of the attached place. Personal experience usually plays the role of a critical determinant of place attachment (Lewicka, 2011). Therefore, length of stay at the attached place is an important factor affecting place attachment (Song and Soopramanien, 2019). Some recent researchers suggest that place attachment is a potential motivator of pro-environmental behaviours (Scannell and Gifford, 2010b). A potential explanation is that place attachment strengthens the perceptions of driving factors of sustainable behaviours, such as positive attitude (Halpenny, 2010), beliefs and normative factors (Raymond et al., 2011; Yu et al., 2019). Some empirical studies also observed the direct effect of place

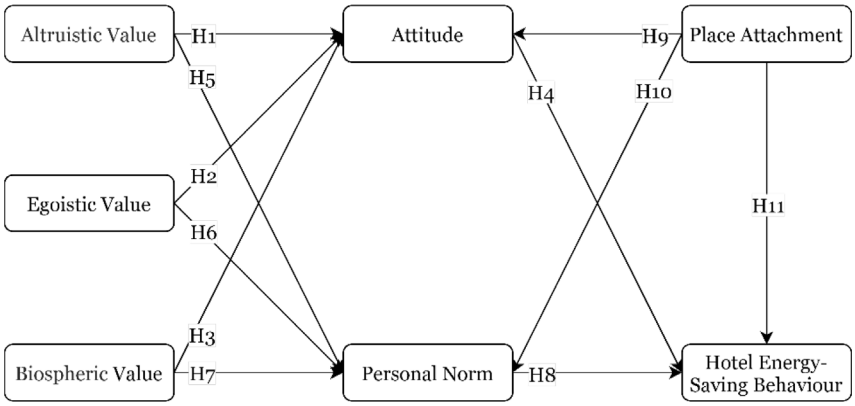

Fig. 1. The theoretical framework.

attachment on sustainable actions in parks (Halpenny, 2010) and pro-environmental behaviours in tourism (Qu et al., 2019; Wang et al., 2023).

Extended-stay accommodation goes beyond ordinary hotel visits in the hotel-guest relationship, and presents some characteristics of long-term rentals (i.e., no ownership but a sense of identity). Long-stay hotel guests tend to develop a place attachment to their guest rooms and hotels (Lewinson, 2010, 2007; Prayag and Lee, 2019). For example, Lewinson (2007) found that extended-stay guests are more likely to describe hotel dwellings as their home. Attachment is an important factor that drives people to protect the environment and place that they value (Ramkissoon et al., 2012; Song and Soopramanien, 2019). However, there is almost no published literature discussing the role of place attachment to sustainable behaviours of long-stay hotel guests. Based on the relevant literature, this study proposes the following hypotheses:

H9. Place attachment has a significant and positive influence on attitude towards energy-saving behaviours of long-stay hotel guests.

H10. Place attachment has a significant and positive influence on personal norm towards energy-saving behaviours of long-stay hotel guests.

H11. Place attachment has a significant and positive influence on energy-saving behaviours of long-stay hotel guests.

In light of the above discussion and hypotheses, this study develops the following conceptual framework (refer to Fig. 1).

3. Methodology

3.1. Measures

A questionnaire survey is a widely used social science research method, in which investigators use a uniformly designed instrument to gather information from target research objects. The study adapts items based on the research topic to measure altruistic values, egoistic values and biospheric values, respectively (De Groot et al., 2007; Rahman and Reynolds, 2016; Steg et al., 2014b; Stern, 1999; van Riper et al., 2018). Each construct contains three items. In addition, the study uses four items adapted from Han and Hyun (2018) and Wang et al. (2020) to assess attitude and personal norm of hotel guests. Place attachment is measured by three items as well (Bonaiuto et al., 2008; Qu et al., 2017). Energy-saving behaviours are partly adopted from Wang et al. (Wang et al., 2020, 2021a) and the established self-reported behaviour inventory (Horng et al., 2014). The behavioural attribute is measured by four items (four dimensions).

The questionnaire employs a five-point Likert scale to measure psychological factors (i.e., attitude and personal norm), place attachment, and self-reported energy-saving behaviours. A seven-Likert scale is used to measure altruistic values, egoistic values and biospheric values and place attachment. The study invited 20 participants from academia, hotel industry and guest to test the readability and the design of the questionnaire as a preliminary test. The researchers refined and finalised the questionnaire according to feedback from the test.

Moreover, the study invites the survey participants to fill in a few socio-demographic information including gender, age, education experience, marital status, yearly income and occupation. More importantly, the survey form consists of question-related on the research topic of hospitality: frequency of visiting hotel, hotel level as well as the main purpose of living in a hotel.

3.2. Data collection

The study entrusted a leading market research organisation in mainland China for collecting opinions from hotel guests. Shanghai, one of the mega cities in China, is selected as the study area. A total number of 749 responses were collected from September to December 2021. As each question was designed as a mandatory reply, there were no missing values in collected data. This study excluded a few samples by verifying hotel-stay experiencing and reviewing extreme outliers and pitfall questions. In the study, 609 usable responses were retained remained for further processing. The socio-demographic information profile of respondents is presented in results.

3.3. Statistical analysis

The study first conducted a descriptive analysis of the data to summarise the socio-demographic information of hotel guests. Secondly, the study estimated the goodness of fit of the proposed research framework. After the confirmation of a good model fit, the study tested the data quality by employing measurement modelling to evaluate the convergent validity and discriminant validity. After that, the study employed structural equation modelling (SEM) in the data analysis procedure. The SEM is a method that is widely used in behavioural studies which could model relationships between latent variables and analyse the effect of variables on overall and the relationship between indicators (Hair et al., 2011). It is proposed that the partial least squares (PLS) technique is one of the main SEM approaches (Hair et al., 2011). The PLS is a statistical method that is similar to multi-regression analysis, but it is efficient in a wider range of sample sizes and is a more sophisticated model with less restriction on data (Hair et al., 2011). The study aims to explore relationships in the proposed

Table 1
Respondents profile.

Category	Item	Frequency	Percentage
Gender	Male	271	44.49%
	Female	336	55.17%
	Prefer Not to Say	2	0.33%
Age	≤25	37	6.08%
	26 to 30	257	42.20%
	31 to 40	220	36.12%
	41 to 50	87	14.29%
	51 to 60	4	0.66%
	>60	4	0.66%
Education	Secondary or below	13	2.13%
	High School or Equivalent	58	9.52%
	Diploma or Equivalent	176	28.90%
	Bachelor's Degree or Equivalent	330	54.19%
	Master's Degree or Equivalent	29	4.76%
	Doctoral or Equivalent	3	0.49%
Marital Status	Unmarried	350	57.47%
	Married without Children	122	20.03%
	Married with Children	137	22.50%
Yearly Income	50K to 100K	216	35.47%
	100K to 150K	148	24.30%
	150K to 200K	112	18.39%
	200K to 250K	58	9.52%
	250K and above	30	4.93%
	Not Applicable	45	7.39%
Occupation	Manager	161	26.44%
	Technical	229	37.60%
	Administrator	108	17.73%
	Self-employment	55	9.03%
	Unemployment	53	8.70%
	Other	3	0.49%
Frequency of Visiting	At least Once a week	34	5.58%
	Once to Four Times a month	227	37.27%
	Once Few Months	306	50.25%
	At Most Once a Year	42	6.90%
Hotel Level	Budget	246	40.39%
	Economy	71	11.66%
	Comfort	145	23.81%
	Higher Standard	124	20.36%
	Superior	23	3.78%
Visiting Purpose	Leisure	108	17.73%
	Extended-Stay Residence	159	26.11%
	Business	331	54.35%
	Other	11	1.81%

research model and find out the difference between hotel guests with different purposes for visiting. Therefore, the PLS-SEM was carefully adopted and a typical software, SmartPLS, has been used for the analysis.

4. Results

4.1. Respondent profile

Table 1 summarises participants' socio-demographic information. Within 609 valid respondents, over 50% of respondents (N = 336) are female hotel guests and 44.49% (N = 271) are male. A number of 257 respondents aged from 26 to 30, followed by the age group of 31 to 40 (N = 220) and 41 to 50 (N = 87). Approximately 54.19% (N = 330) of participants hold a bachelor's degree. About 0.525% of participants experience postgraduate training. Meanwhile, more than half (57.47%) of the respondents report their marital status as unmarried, 20.03% (N = 122) of them married without children and 22.50% (N = 137) of participants are married with children. In addition, the yearly income of 35.47% of respondents ranges between 50K and 100K. The second highest income group (100K to 150K) has 148 respondents, while only 4.93% (N = 30) of people gained 250K and above in a year. 37.60% (N = 229) of hotel guests are technical people and 26.44% (N = 161) of guests are responsible for management duty in a corporation. Questions about the frequency of hotel visits, almost half (50.25.28%) of respondents visit a hotel once a few months. Around 40 per cent (N = 246) of respondents used to visit a budget hotel, followed by those who chose to stay in comfort (23.81%) or a higher standard (20.36%) hotel. Furthermore, among all respondents, 54.35% of them live in hotel for commercial purposes. Some guests visit a hotel as a resident (26.11%) or stay in a hotel for leisure activities (17.73%).

4.2. Data quality: Measurement modelling

The PLS-SEM method should be divided into two steps: measurement modelling and structural modelling. The measure measurement model analyses the convergent validity (CV) and discriminant validity (DV) to examine data quality. The CV aims at estimating the correlation between indicators, which adopt (1) Cronbach's alpha, (2) composite reliability (CR), (3) Average Variance Extracted (AVE) and (4) factor loading as evaluation criteria. The suggested criteria standards are summarised below:

1. Cronbach's alpha is suggested to be higher than 0.50 (Leontitsis and Pagge, 2007);
2. The CR value is suggested to be higher than 0.60 or above (Fornell and Larcker, 1981b,a);

Table 2
Convergent validity assessment result.

Latent variables	Items	Loading	Alpha	CR	AVE
Altruistic Values	ATV-1	0.835	0.805	0.885	0.719
	ATV-2	0.799			
	ATV-3	0.906			
Egoistic Values	EGV-1	0.855	0.537	0.752	0.512
	EGV-2	0.737			
	EGV-3	0.512			
Biospheric Values	BSV-1	0.686	0.771	0.860	0.674
	BSV-2	0.858			
	BSV-3	0.902			
Attitude	ATT-1	0.774	0.600	0.789	0.556
	ATT-2	0.741			
	ATT-3	0.721			
Personal Norm	PN-1	0.766	0.706	0.836	0.630
	PN-2	0.821			
	PN-3	0.793			
Place Attachment	PA-1	0.843	0.707	0.836	0.634
	PA-2	0.646			
	PA-3	0.880			
Hotel Energy-Saving Behaviour	HESB-1	0.726	0.739	0.836	0.561
	HESB-2	0.724			
	HESB-3	0.788			
	HESB-4	0.755			

Table 3
Discriminant validity assessment result.

Constructs	ATV	EGV	BSV	ATT	PN	PA	HESB
ATV	0.848						
EGV	0.745	0.716					
BSV	0.660	0.615	0.821				
ATT	0.384	0.245	0.562	0.745			
PN	0.391	0.285	0.363	0.509	0.793		
PA	0.250	0.255	0.417	0.515	0.365	0.796	
HESB	0.243	0.194	0.430	0.685	0.477	0.560	0.749

Note: 1. ATV: Altruistic Values; 2. EGV: Egoistic Values; 3. BSV: Biospheric Values; 4. ATT: Attitude; 5. PN: Personal Norm; 6. HESB: Hotel Energy-Saving Behaviour; 7. PA: Place Attachment.

3. The AVE is suggested to be higher than 0.50 (Fornell and Larcker, 1981a; Hair et al., 2011);
4. Factor loading is suggested to be higher than 0.50 (Afthanorhan, 2013);

Table 2 shows the measurement result of CV. The result implies that Cronbach's alpha of all constructs ranges between 0.537 and 0.805, and each value is greater than the threshold of 0.50. The assessment of CR values ranges from 0.752 to 0.885 and all values are larger than the cut-off of 0.60. The AVE value of all items exceeds the required criteria of 0.50, the values range from 0.512 to 0.719. Also, the values of factor loading are shown, which range between 0.512 and 0.906 and fulfil the requirement of higher than 0.50. Thus, the result shows that all constructs provide evidence of convergent validity.

Furthermore, DV argues that the observed values should be able to be discriminated when applying different methods to measure different constructs. A construct that can be recognised as valid should match the Fornell–Larcker criterion shown below (Fornell and Larcker, 1981a):

1. the square root of AVE ($\sqrt{AVE}$) of the construct is higher than the correlation between that construct and other constructs in the model.

Table 3 presents that the AVE values of constructs are greater than the square of between-variable correlations, which fulfils the statistical requirement for discriminant validity.

Table 4
Result of collinearity and coefficient of determination.

Items	VIF	Items	VIF	Items	VIF	Items	VIF
ATV-1	1.881	ATT-1	1.248	PA-1	1.714	HESB-1	1.377
ATV-2	1.537	ATT-2	1.184	PA-2	1.181	HESB-2	1.495
ATV-3	2.124	ATT-3	1.185	PA-3	1.715	HESB-3	1.659
BSV-1	1.538	PN-1	1.290			HESB-4	1.360
BSV-2	1.554	PN-2	1.464				
BSV-3	1.973	PN-3	1.434				
EGV-1	1.285						
EGV-2	1.132						
EGV-3	1.155						
Attitude				$R^2 = 0.541$			
Hotel Energy Saving Behaviour				$R^2 = 0.641$			
Personal Norm				$R^2 = 0.333$			

4.3. Evaluation of hypotheses: Structural equation modelling

The study tests the collinearity issues to confirm whether there is a collinearity problem between variables or not to avoid the impact of variables on the contribution of the model. Variance Inflation Factor (VIF) is a standard to quantify the collinearity issue, which ranges below 5 reflecting no necessitates correcting multicollinearity (Hair et al., 2011). Also, the coefficient of determination (R^2) has been assessed to assess the explanatory accurateness of the regression model. A R^2 result of 0.20 is consider as high standard in the behaviour studies (Hair et al., 2011). Table 4 shows the result of the variance inflation factor (VIF) and R^2.

In addition, different to the covariance-based SEM method, PLS does not provide various statistical measures for the model validation, such as χ^2 and other model fit measurements (Henseler and Sarstedt, 2013; Wan et al., 2017). The study uses the goodness of fit (GoF) index to measure the model fit of the proposed. The GoF is defined as "The GoF represents an operational solution to this problem as it may be meant as an index for validating" (Tenenhaus et al., 2005). Mital et al. (2018) suggested that the index value of 0.1, 0.25, and 0.36 is considered as a small, medium, and large explanatory ability of the model. According to (Mital et al., 2018; Tenenhaus et al., 2005). The formula for GoF is offered below:

$$\text{Goodness of Fit} = \sqrt{\frac{(AVE_1 + \ldots + AVE_n)}{n} \times \frac{({R_1}^2 + \ldots + {R_n}^2)}{n}}$$

Table 4 reveals the VIF of all variables below the threshold of lower than 5 (Hair et al., 2011; Haas et al., 2017). The analysis result illustrates the explanatory ability for attitude ($R^2 = 0.441$), personal norm ($R^2 = 0.333$) and hotel energy-saving behaviour ($R^2 = 0.541$) exceed the cut-off value. According to the calculation method, the GoF value the proposed model is 0.56, which can be explained as a high explanatory ability.

Structural Equation Modelling (SEM) is used to explore the influence relationship between multiple latent variables. The study employs the SEM method with 5000 samples bootstrapping to test the degree of statistical significance between variables. Table 5 and Fig. 2 display the detailed structural model result.

The hypothesis testing result shows that the valid coefficient ranges between −0.273 and 0.478. The path from altruistic values ($\beta = 0.203$, $p = 0.003$), egoistic values ($\beta = -0.273$, $p < 0.001$), biospheric values ($\beta = 0.451$, $p < 0.001$) to attitude are significant. Thus, hypotheses 1 and 3 are supported. However, although a significant relationship is shown between egoistic values and attitude, the effect of egoistic values is negative. The findings show that altruistic values and biospheric values have a positive influence on the eco-friendly attitude of hotel guests

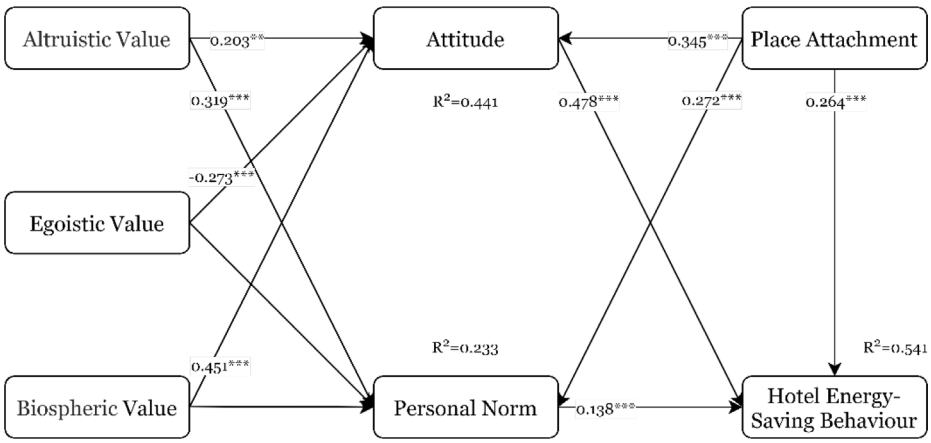

Fig. 2. Structural Equation Modelling Result.

Table 5
Result of structural equation modelling.

Hypothesis	Path	Overall		Leisure		Residents		Business	
		β	Sig.	β	Sig.	β	Sig.	β	Sig.
H1	ATV → ATT	0.203	0.003	0.217	0.072	0.184	0.067	−0.009	0.943
H2	EGV → ATT	−0.273	0.000	−0.278	0.044	0.158	0.458	−0.195	0.052
H3	BSV → ATT	0.451	0.000	0.192	0.048	0.374	0.000	0.580	0.000
H4	ATT → HESB	0.478	0.000	0.227	0.013	0.583	0.000	0.460	0.000
H5	ATV → PN	0.319	0.000	0.599	0.054	0.256	0.011	0.288	0.002
H6	EGV →PN	−0.076	0.290	−0.298	0.307	−0.207	0.318	−0.089	0.351
H7	BSV → PN	0.085	0.155	0.078	0.735	−0.044	0.590	0.193	0.034
H8	PN → HESB	0.138	0.000	0.496	0.000	0.191	0.000	0.265	0.000
H9	PA → ATT	0.345	0.000	0.328	0.003	0.313	0.000	0.259	0.000
H10	PA → PN	0.272	0.000	0.083	0.469	0.608	0.000	0.191	0.001
H11	PA → HESB	0.264	0.000	0.408	0.000	0.420	0.000	0.173	0.001

Note: 1. ATV: Altruistic Values; 2. EGV: Egoistic Values; 3. BSV: Biospheric Values; 4. ATT: Attitude; 5. PN: Personal Norm; 6. PA: Place Attachment; 7. HESB: Hotel Energy-Saving Behaviour.

while biospheric values take over a negative impact on guests' attitudes. The estimates of the standardised coefficients of hypothesis 4 reveal that attitude ($\beta = 0.478$, $p < 0.001$) exerted a highly positive significant influence on hotel energy-conservation behaviour. Hypotheses 5, 6 and 7 are examined and the result implies that the linkage between altruistic values ($\beta = 0.319$, $p < 0.001$) and personal norm is positive and significant. However, egoistic values and biospheric values are not significantly associated with personal norm. Therefore, hypothesis 5 is supported, but hypotheses 6 and 7 are not supported. The SEM result of hypothesis 8 shows that personal norm ($\beta = 0.138$, $p < 0.001$) is a significant function of hotel energy eco-friendly behaviour. Moreover, hypotheses 9, 10 and 11 are assessed and place attachment is found to be a significant predictor of attitude ($\beta = 0.345$, $p < 0.001$), personal norm ($\beta = 0.272$, $p < 0.001$) and hotel energy-saving behaviour ($\beta = 0.264$, $p < 0.001$). Hence, hypotheses 9, 10 and 11 are supported.

The study divides the hotel guest into three groups according to their purpose of visiting a hotel. As the sample sizes of each group are different and the sample of two groups only exceeds 100, the study set the significant value as $p < 0.1$.

The regression path from altruistic values to guests' attitude of the leisure group ($\beta = 0.217$, $p = 0.072$) and resident group ($\beta = 0.184$, $p = 0.067$) is positive and significant while the business group shows an irrelevant result. The SEM results illustrate that egoistic values significantly decreased the attitude of leisure people ($\beta = -0.278$, $p = 0.044$) as well as the business group ($\beta = -0.195$, $p = 0.052$). However, the correlation between egoistic values and the attitude of residents is not significant. Moreover, the proposed influence of the biospheric values on the attitude of the three groups is positive. Biospheric values is found to have the greatest effect on the attitude of the residents' group ($\beta = 0.580$, $p < 0.001$). Also, the result shows that biospheric values affect the business group ($\beta = 0.374$, $p < 0.001$) and leisure group ($\beta = 0.192$, $p = 0.048$) positively.

As expected, altruistic values are positively and significantly associated with personal norm in all groups. It is worth noting that altruistic values ($\beta = 0.599$, $p < 0.01$) of leisure group is the most significant antecedent to the personal norm among the three groups, followed by the group of business ($\beta = 0.288$, $p = 0.002$) and residents ($\beta = 0.256$, $p = 0.011$). However, egoistic values cannot significantly predict any dimension of personal norm in all three groups. In addition, biospheric values provide no support for leisure people and residents while it positively sustains a prediction of personal norm in the business group ($\beta = 0.193$, $p = 0.034$).

Moreover, the findings imply that customers' place attachment contributes to the attitude of all groups. Place attachment plays the strongest critical role in leisure people's attitude ($\beta = 0.328$, $p = 0.003$). Also, the attitude of residents ($\beta = 0.313$, $p < 0.001$) and guests for business ($\beta = 0.259$, $p < 0.001$) is positively influenced by place attachment. Meanwhile, place attachment has a highly significant and positive effect on personal norm of residents ($\beta = 0.608$, $p < 0.001$). Its direct effect on business guests is slightly positive ($\beta = 0.191$, $p = 0.001$). However, its effect is not significant result in the group of people aims for leisure activities.

Moreover, the results of the estimation in leisure, residents and business group indicates that hotel energy-conservation behaviour is enhanced by attitude. The effect on residents is the highest ($\beta = 0.583$, $p < 0.001$), followed by the estimated effect in the business group ($\beta = 0.460$, $p < 0.001$) and leisure group

(β = 0.227, p = 0.013). Personal norm is a significant and positive function of the hotel practices of energy-saving for the leisure (β = 0.496, p < 0.001), business (β = 0.265, p < 0.001), and resident (β = 0.191, p < 0.001) groups. Furthermore, the hotel energy-saving behaviour of all participants is enhanced with greater place attachment. The predictive ability of place attachment on residents, leisure, and business group are 0.420, 0.408 and 0.173, respectively.

5. Discussion

5.1. Theoretical contributions

Hotel energy consumption is highly relevant to behaviour of guests. With the revival of extended-stay accommodation services, promoting conservation behaviours of long-stay guests is a promising energy management strategy in sustainable hospitality operations. However, long-stay customers' pro-environmental decision-making process for energy-saving has not been clearly explained. This study attempts to distinctly interpret the underlying causes of long-stay guests' behavioural patterns. The proposed model in this study takes environmental values, and psychological factors and place attachment as predictors, which is found to well-predict the energy-savings behaviour of long-stay guests. In addition, the study considers the behavioural mechanism of guests with different travel purposes and finds out that long-stay customers display heterogeneous behavioural patterns. The findings of the study offer a solid framework and benefit further research relate to long-stay hotel customers' eco-friendly behaviours.

5.1.1. Environmental values

The findings verified the positive effect of altruistic values on attitude and personal norm. The individual with altruistic tendencies advocates protecting the environment and saving energy resources, which is consistent with previous research (Steg et al., 2014a). Also, altruistic individuals have belief and norm that support the environment, and this tendency affect long-term norm (Steg et al., 2014a). Altruistic characteristics make individuals pay more attention to the well-being of others and society and feel self-worth realisation by conservating energy usage in a hotel.

The analysis suggests that egoistic values harm energy-saving attitude and play negative role in energy-saving behaviours. The finding is in line with Nguyen et al. (2017), who argued that egoistic values reduced environmental-related behaviours. Egoistic values make people focus on protecting and increasing personal resources and ignore taking actions for environmental protection. Therefore, egoism, which is associated with a lower environmental attitude, causes an unsupported behaviour for energy conservation. This research suggests that egoistic values does not significantly affect personal norms towards energy-saving behaviours.

Previous studies on environmental psychology have shown that biospheric values play an important role in engaging pro-environmental behaviours (Steg et al., 2014a). In line with most of those studies, this research observes that attitude towards energy-saving and personal norm of long-stay guests are positively motivated by biospheric values. The biospheric values is related to individual evaluation of the environmental consequences, which means that people will consider the outcome caused by their behaviours and are more inclined to engage in hotel energy-saving behaviours.

5.1.2. Attitude and personal norm

The empirical results also find that attitudes and perceived moral obligations can directly drive energy-saving behaviours of long-stay guests. This finding supports several previous studies on the critical influence of activated attitude and personal norms (Steg et al., 2014a,b; Verma and Chandra, 2018). In this study, attitudes contributed significantly to the explanation of hotel energy-saving behaviours, suggesting that long-stay guests are likely to participate in the practice since they consider the energy-saving behaviours will contribute to a positive effect. The result of the study accordance with the previous research that long-stay hotel guests' energy-saving behavioural practices increase with their sense of moral obligation to engage in energy-saving behaviours. It could be explained as personal norms that drive people to consider the values and appropriateness of energy-saving behaviour (Lindenberg and Steg, 2007).

5.1.3. Place attachment

The study extends the literature with place attachment as an influencing factor on long-stay hotel guests' behaviour patterns. The results of the study prove that place attachment is a significant predictor of attitude, personal norm and hotel energy-conservation behaviour. This is similar to previous research results, that is, place attachment is significantly associated with pro-environmental behaviour (Junot et al., 2018; Zhang et al., 2014) and strengthening pro-environmental behaviour increase individuals' place attachment (Gosling and Williams, 2010). The long-stay demand of hotel guests makes them communicate with the hotel's related personnel such as staff. At the same time, the hotel provides functional services for the guests, which satisfy the requirements of the guests and thus increase guests' dependence on the hotel. Overall, person, process, and place make guests emotionally attached to the hotel and form effective bonds. Long-stay customers are aware of the impact their energy use has on the hotel and the environment, and therefore come into environmentally friendly attitudes, personal norms and like to engage in energy-saving behaviours. In hospitality cases, friendly hotel employees and warm services can be specially important to develop place attachment of guests (Prayag and Lee, 2019), and therefore, can further contribute to energy saving of long-stay guests.

5.1.4. Behavioural heterogeneity

The differences in the influence of values on cognitive factors can be an explanation for the observed behavioural heterogeneity across customer groups, e.g., (Dodds and Holmes, 2022; Millar et al., 2012). This study finds that the self-transcendence values (including biospheric values and altruistic values) play important roles in energy-saving behaviours of long-stay hotel guests, especially business guests. Biospheric values, in particular, is the most important contributor to attitudes. This finding supports the statements of several studies on pro-environmental behaviours (Tiwari, 2022). Especially, the guests of the residence group are more likely to hold a more positive attitude towards behaviours that align with their environment-related behavioural criteria. Surprisingly, the statistical effect of biospheric values on personal norms is below expected. Altruistic values have a stronger effect on personal norms than biospheric values, and biospheric values only significantly affect the personal norms of business guests among the three groups. This suggests that benefits to others, such as considering hotel operating costs, staff well-being, and the comfort of other guests, are more likely to motivate long-stay guests' moral obligations than recognition of the biospheric and environmental protection.

Interestingly, this study observes that the effects of attitude and personal norm on different types of long-stay guests are heterogeneous. The findings are in line with some previous discussions of pro-environmental behaviour differences between

business and tourism travellers (Dodds and Holmes, 2022; Millar et al., 2012). In the context of long-stay services, however, this heterogeneity seems to be magnified and has more practical implications. Compared with residence and business guests, leisure accommodation has stronger hedonic nature (Steg et al., 2014a), which in turn enhances the hedonic goal setting and weakens the influence of attitudes. Therefore, business guests may be more likely to engage in energy-saving behaviours than leisure guests with similar attitudes towards energy-saving behaviours. In contrast, leisure guests are more sensitive to their individual principles of behaviour: guests are more likely to reduce energy waste during their leisure stays for their perceived moral obligations.

Many studies have evidenced the fact that tourists tend to behave less environmentally-friendly than residents. However, the results of this study provide insights to explain such observations from the perspective of place attachment. The study found that when guests feel a sense of belonging to the hotel, they are more likely to conserve energy during their stay. The attitude of the three groups' attendance has a high possibility to influence by place attachment. A similar result has been observed in the relation between place attachment and hotel energy-conservation behaviour. Somewhat differently, compared with leisure and residents, business people have lower place attachment. It is probably because business group are more concerned about work responsibilities and completion, rather than experiencing the hotel as somewhere relaxing thus decreasing the dependence on the hotel. Moreover, place attachment does not have a correlation to tourists' personal norm. It may be that the hedonic function of the hotel is obvious to the group. However, for people who see hotels as accommodation, it is found that place attachment has a high impact on their personal norm. This validates residents' emotional and social connection to and dependence on the hotel.

5.2. Theoretical contribution

A potential theoretical contribution is to identify the linkage between values, psychological factors and place attachment and long-stay hotel guest energy-saving behaviour. The results of the study demonstrate that self-transcendence values (i.e., biospheric values and altruistic values) positively motivate long-stay hotel customers' attitude and personal norm, while self-enhancement values (i.e., altruistic values) have negative effects on customer attitude. At the same time, attitude and personal norm play an important role in customers' energy-saving behaviour in hotels. In addition, place attachment positively affects the attitude, personal norm and behaviour of customers in implementing hotel energy-saving behaviours. Despite previous research efforts to reduce pollution and consumption in the hotel industry, however, given the hedonic nature of hotels, past research has paid less attention to promoting customer energy conservation behaviour in the hotel. Therefore, this study is of great significance in theory contribution, because it provides an understanding of the values, psychological factors and place attachment of customers in implementing hotel guest energy-saving behaviours and explains the differences formation mechanism of customers with different visiting purposes.

5.3. Practical implications

This research provides some practical implications for promoting energy-saving behaviours in the hotel sector. Compared with the ordinary short-stay guests, long-stay guests tend to spend more time at hotels and therefore, are more likely to develop an environmental attachment and be intervened. As a result, the targeted interventions and incentives focusing on long-stay guests are more effective and cost-efficient. This study provides a theoretical framework and identify the critical factors to guide the behaviour-driven energy conservation in hotels. For example, the findings suggest that altruistic values are a predictor of long-stay guests' attitudes and personal norms. Thus, hoteliers can promote energy-saving behaviours by emphasising the benefits of such behaviours to others. For instance, hotels can use energy-saving reminders to list these benefits, such as extending the facility service life, reducing the burdens on the housekeeping staff, cutting down carbon emissions and the greenhouse effect, and protecting the living environment of others. Also, the study finds the important role of biospheric values in driving energy-saving behaviours among hotel guests. Hotel operators are suggested to enhance biospheric and environmental values by promoting environmental knowledge related to hotel energy conservation. For instance, hotels can emphasise the environmental knowledge by providing booklets at guest rooms and reservation websites to make the information more accessible. Additionally, hotels should provide a steady stream of authentic contextual information and make sure that their products align with environmental values, which can enhance consumer attachment through engaging and informative advertising campaigns on social media platforms.

In addition to general interventions, it is also important to make the interventions more targeted. The findings of this study provide hoteliers with a practical reference for the development of targeted energy-saving interventions for long-stay guests. For example, we find that personal norm presents a significant stronger effect on leisure guests. Therefore, normative interventions, such as normative requirements, messages, and tips, would be more effective for long-stay guests for leisure include. However, monetary incentives, such as promising a donation to environmental charities and discounted price, would be not ideal for long-stay business guests. Besides, the effect of place attachment is that the attachment to the hotel positively promotes the environmental protection attitude, personal norms, and energy-saving actions of all three types of long-stay guests. Thus, hoteliers would enhance the place attachment by improving the hotel image, providing customised services, and organising activities (e.g., free luncheon) for long-stay guests. These practices can build an emotional bond between customers and further strengthen the hotel-customer relationship. Also, during the COVID-19 pandemic, crisis communication focusing on shared emotions would be another important method to establish such emotional attachment with hotel guests (Hang et al., 2020). Besides, the hoteliers are suggested to carry out environmental education and publicity activities related to green consumption willingness, cultivate public opinion and values, and promote responsible energy consumption behaviours of guests.

The findings of study can also contribute to the sustainable development goals (SDGs). First, the findings would support targeted intervention to promoting energy-saving behaviours of long-stay hotel guests. These interventions include both information-based interventions and monetary incentives. As the irresponsible behaviour of guests has been an important factor driven the energy and resource overconsumption in hotels, these interventions would significantly contribute to the sustainability of the hotel sector and the 12th SDG: responsible consumption and production. Also, the findings would also support the environmental protection and resource conservation of the tourist destinations, and therefore, contribute to the 11th SGD: sustainable cities and communities.

5.4. Limitations and further directions

The research has a few limitations. Firstly, the analysis of this study is based on the self-report data from respondents,

which might be subjective. Further studies would benefit from novel sensor-based data collection for PEB assessment to avoid bias in self-evaluation. Secondly, this study collected the survey data during the COVID-19 pandemic period. The restrict zero-case and lockdown control strategy might have an impact on the hotel-stay patterns. For example, people may have less chance to make inter-city travel and therefore, have a lower demand for hotels and other accommodation services. Third, the study area is limited into mainland China. People from different cultural, economic and social backgrounds may have different cognition and realisation of hotel energy-saving behaviours. Similar research can be extended to other regions so as to put forward specific suggestions for local hotel energy-saving implementation.

The study also provides some directions for further studies, extensions and practices. First, this study only focuses on energy-saving behaviour but excludes other pro-environmental actions in hotels. Further studies might explore more about the factors and mechanism driving different kind of hotel pro-environmental behaviours, such as recycling, food conservation, and towel reuse. Also, studies would also consider exploring the spill-over effects of pro-environmental actions in hotels. Second, based on the findings of this study, the following studies would develop and test more targeted interventions and incentives to encourage energy-saving behaviour (and other sustainable behaviours) in hotels. For example, following researchers are strongly recommended to empirically compare effect of (1) the targeted and non-targeted interventions, and (2) novel (e.g., energy-saving options) and traditional (e.g., monetary incentives and energy-saving tips) interventions. Third, further studies are encouraged to extend the theoretical model in this study. Especially, further studies would benefit from exploring the roles of other potential psychological factors to develop a more solid and comprehensive model to explain PEBs in the hotel context.

6. Conclusion

The research develops a theoretical framework consisting of environmental values, psychological indicators, and place attachment to explain the energy-saving behaviours of long-stay hotel guests. First, based on the proposed model and 609 valid survey data, this study examines the roles of the above factors in energy-saving decision-making of long-stay guests. The self-transcendence values (i.e., biospheric and altruistic values) positively drive energy-saving behaviours, while the self-enhancement values (i.e., egoistic values) present a negative effect. The study also finds that attitude and personal norms play positive roles in energy-saving behaviours and bridge the environmental values and behaviours. Additionally, the research reveals the critical role of place attachment in hotel energy-saving behaviours. Second, when considering the different visiting purposes of guests, the study observed a significant heterogeneity among different groups. Altruistic values have a stronger effect on leisure guests than other groups, and biospheric values are more effective to guests for business purposes. Also, leisure guests are more sensitive to personal norms. In addition, place attachment mostly strengthens environmental attitudes, norms and practices of people who stay in a hotel as accommodation. The findings of this research provide a novel insight into behaviour-driven energy-saving in hotels from the perspective of values and in the context of long-stage guests. The study, especially, clarifies the critical of place attachment in PEBs of long-stay guests and identify the critical drivers if guests with different purposes. The findings would contribute to developing smarter hotel energy management strategies and targeted energy-saving incentives and interventions for long-stay guests. These interventions can further contribute to energy and resource conservation in hotels and support the achievement of Sustainable Development Goals (SDGs) in both hospitality industry and local communities.

CRediT authorship contribution statement

Qian-Cheng Wang: Conceptualization, Methodology, Writing – original draft, Writing – review and editing. **Yi-Ning Lou:** Data curation, Formal analysis, Resources. **Xuan Liu:** Resources, Validation, Writing – review and editing. **Xin Jin:** Data curation, Resources, Writing – review and editing. **Xuewei Li:** Resources, Supervision, Investigation, Writing – review and editing. **Qian Xu:** Resources, Validation, Writing – review and editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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