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Article

The role of green intelligence in promoting destination social accountability and eco-friendly behavior of visitors: An empirical investigation of tourist site

Dini Anggraeni*, Abd. Rahman Kadir, Muhammad Sobarsyah, Mursalim Nohong, Sanusi Fattah

Department of Economics, Faculty of Economics and Business, Hasanuddin University, Makassar 90245, Indonesia
*** Corresponding author:** Dini Anggraeni, dinisdsam@gmail.com

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Abstract: This study examines the interplay between eco-friendly behaviour (Eco-FB) at multiple systemic levels, addressing the complexity beyond the scope of single-level models. We propose a comprehensive model incorporating traditional individual, organizational, and relational level concepts and a situational construct exemplified by Bali Island Recognition. This model was tested in Bali Island's tourism firms through online and offline surveys of 500 tourism-related employees and their gateway communities across Bali Island. The research investigates the differences in pro-environmental conduct between two destinations' social accountability (DSA) groups categorized as high and low DSA clusters. It further explores how ecological value, green intelligence, DSA, and sustainable travel affect public and private Eco-FB. The findings indicate that green intelligence has a strong positive connection with Eco-FB, and high DSA significantly impacts eco-friendly behaviour. This research enhances our understanding of Eco-FB by presenting a multilevel model incorporating the Bali Island factor, revealing distinctive impact mechanisms for both public and private Eco-FB.

Keywords: eco-friendly behavior; destination social accountability; ecological value; green intelligence; Bali Island in Indonesia

1. Introduction

With the growing population of tourists seeking different forms of enjoyment and enhanced business productivity due to economic development and social progression, the tourism section is growing (Wang et al., 2020). This advancement in tourism increases the flow of people, which, though incredibly beneficial financially, has several concerns concerning ecological degradation in the regions considered tourist spots (Chan et al., 2017). The objective loses focus on ecology; a broad aspect is inclusive of the following: the aspect entails the generation of more waste, energy use occasioned by tourists, and the elevated levels of carbon dioxide pollution as a result of increased movement along the roads (Katircioglu et al., 2014). This work mainly concentrates on travellers' ecological experiences in managing the environmental impacts occurring in tourist sites (Choi and Kim, 2021; Mustapha et al., 2024). These actions can include any activities like the non-generation of waste or recycling waste where it has been generated, rationing of water and energy, and use of environmentally friendly means of transport. However, more studies must be published from the resident's viewpoint in tourism-focused areas.

Currently, it is widely accepted that consumers who are residents of the destinations significantly contribute towards the degradation of the environment in tourism zones (Wang et al., 2020). Due to their close interaction in or near tourist attraction sites, the local people's daily activities and recreation are closely associated

with the places (Kelly et al., 2007). Possible issues include local people's unsustainable use of resources and unwelcome environmentally unfriendly practices that affect the sustainability of the visited tourist attractions. Further, various environmental activities of regional citizens are essential to increase the sustainability of each relevant region. There are growing signs that through promoting locals to participate in optional environmentally friendly activities, tourism activities are gradually achieving the ultimate goal of sustainable development (Li et al., 2024; Zhang and Huang, 2019). Also, due to the rise of ecological consciousness among travel administrators, the locals' concerns have been awakened regarding the sustainable enhancement of those places (Wang et al., 2020). At the contextual level, many administrators and authorities have formulated rules, laws, and announcements to develop an environment of durability concerning the ecological issues of the users and in response to the general upward attitude (Balaji et al., 2019).

When considering whether to engage in ecological acts, people look to their surroundings for guidance (Leung and Rosenthal, 2019). Research has confirmed that policy, rules, and communications initiatives to promote ecological behaviour are effective. Leung and Rosenthal (2019) viewed the environment as a contextual component for longevity. The present research on global warming and conservation concentrates on two areas. First, climate-related viability has received widespread attention in studies on ecological behaviour as a regulating factor (Wang et al., 2020). Only a tiny amount of work has examined the impact of observed sustainability-related weather on ecological behaviour. Tourism management might improve the effectiveness of their ecological activity and draw in more participants by investigating how the locals perceive the atmosphere as being connected to sustainability and the method that yields beneficial effects. As a result, it is essential to comprehend "when" (the border conditions) and "how" (the fundamental processes) the observed sustainability-related atmosphere affects inhabitants' ecological activities.

The impression of such elements is crucial for inspiring activity, even while environmental circumstances are critical for enabling human behaviour.

Norton et al. (2015) adopting environmental legislation and rules, for instance, does not ensure that locals have a favourable perception of the hotel's durability. Rather than encouraging activities that are helpful to the ecosystem, locals may perceive such laws and restrictions as merely a facade or an attempt to further their interests.

De Roeck and Delobbe (2012) found that surrounding influences shape people's capacity to accept the action and make mental processes and opinions about the conduct extra prominent.

These effects can either assist or impede particular behaviour (Leung and Rosenthal, 2019). Furthermore, there are discrepancies among ecological beliefs and environmentally friendly actions taken in daily life (Wang et al., 2020). The contradiction that locals are aware of and concerned about ecological concerns yet do little about them also persists (Ozaki, 2011).

If inhabitants do not embrace ecological attitudes and habits, no amount of academic research or professional initiative will be fruitful (Wu et al., 2013). The differences in attitudes and behaviour may have new interpretations if regional individuals' ecological behaviours are explained from the standpoint of contextual

antecedents (Bamdad, 2019; Sabbar, 2023). The immediate effect of observed sustainability-related atmosphere on people's ecological behaviour also deserves consideration from contextual antecedents.

A significant kind of restricted land, public gardens draw a sizable number of tourists annually. The people and tourist businesses in and near the mountains and park tourists emphasized ecological conservation. Corporation ecological duty is essential for the viability and sustained growth of those tourist businesses that rely on the assets and tourists of public parks. The expression and cognitive underpinning of business ecological duty and ecological effectiveness is worker Eco-friendly behaviour (Gond et al., 2017). E-PEB, which explains company economic viability and ecological effectiveness from the ordinary person level instead of the organizational level, has recently attracted more educational focus from the disciplines of organizational behaviour, corporate social responsibility (CSR), and human resource management (Lülfs and Hahn, 2014). Green behaviour, organizational environmental citizenship behaviour (OCBE), sustainability conduct, environmental behaviour, eco-friendly behaviour, and preserving behaviour are some of the numerous names or phrases for E-PEB. These phrases have similar implications yet have a few distinct meanings. This essay uses the term "E-PEB". It describes it as "any quantifiable individual conduct that adds to or diverts attention from ecologically sustainable objectives in the work setting," as well as "a place of work kind of ecological behavior" (Norton et al., 2015). Although ecological behaviour (PEB) was thoroughly studied in the personal and family domains, the findings are challenging to apply to the organizational framework. PEB in an organization or business may have distinct motives and drivers. Esfandiar et al. (2020) and Wang et al. (2020) examined 69 articles on green workplace behaviour. The components of EGB were divided into five levels: institution (such as legislation), organization (e.g., green organizational culture, environmental CSR), head of state (e.g., change-oriented administration), team (e.g., observed coworker engagement, environment of the group), and worker (e.g., mentality and drive). Several research studies have currently combined personal and organizational factors to predict E-PEB. Lülfs and Hahn'sn (2014) and Chou'su (2014) studied an organizational-level component moderated by the model at themicro-scalee. After analyzing epidemiological findings on PEB in organizational environments, Lo et al. (2012) proposed that further studies incorporate personal and organizational variables.

2. Literature review

Researchers in tourism and hotels often look at the personal or institutional causes of eco-friendly preserving behaviour environmental behaviour (E-PEB) independently (Pham et al., 2019; Zhang and Huang, 2019). Ecological expertise, consciousness, worry, attitude, customs, beliefs, dedication, and involvement are the individual-level precursors and facilitators (Chan et al., 2017; Zientara and Zamojska, 2018).

The natural world, environmental integration (Rezapouraghdam et al., 2018), and self-directed and regulated drive (Zhang and Huang, 2019). Governance conduct, personable and servant leadership that is focused on the atmosphere, green human resource management, corporate social responsibility, governmental capacity, green organizational environments, and environment protection tactics are the

organizational-level precursors and facilitators (Luu, 2019; Norton et al., 2015; Pham et al., 2019). The relational factors among worker and organization, such as workers' organizational dedication, organizational beliefs, organizational identity, eco-friendly clear roles, work environment mysticism, desire to succeed, and eco-friendly shaping, are also looked at in addition to personal and organizational level variables (Kelly et al., 2007; Luu, 2020). Observed CSR is the assessment and individual perceptions of workers of the group's CSR initiatives, which may differ from the organization's CSR practices. Afsar et al. (2016) stated that the primary and secondary effects of observed CSR on E-PEB, encompassing travel and accommodation, have begun to be studied by researchers. The results show that CSR is viewed as a significant variable that significantly impacts E-PEB.

Luu (2020) examines the impact of ecological activism, green practices, worker well-being, organizational identity, organizational credibility, ecological fit, ethical reflection, ecological dedication, and overall societal satisfaction. Afsar et al. (2016), AlSuwaidi et al. (2021), and Suganthi (2019) stated that, in the domain of hotels, CSR has a significant role in influencing staff green behaviour via worker well-being and individual ecological rules. Personality results from individual and environmental variables (Lewin, 1951). CSR is a situational variable regarding the association between observed CSR and E-PEB. Workers are more inclined to participate in PEB if they believe their company is interested in CSR and focuses on ecological issues (Ruepert et al., 2017). Even though most research treats CSR as a whole, some studies primarily concentrate on the connection between ecological CSR (as a separate aspect or CSR separately) or company ecological responsibilities and E-PEB (Islam et al., 2019; Ruepert et al., 2017).

Islam et al. (2019) explored the regulating role of compassion in the hospitality market as it relates to ecological CSR and organizational identity as E-PEB indicators. The research mentioned previously has a crucial objective: to look into the fundamental processes that describe how CSR affects E-PEB. As a result, in their models, CSR or ecological CSR is frequently an antecedent, while E-PEB is a consequence. Several facilitators and modifiers are also incorporated to help clarify inner and exterior processes. A study on the connection between CSR and E-PEB remains in its early stages. Fryxell and Lo (2003) understand information, ideas, and connections relating to the ecological atmosphere and its main ecosystems, which define ecological awareness. Any attempt to form an opinion or make a choice requires learning as a prerequisite (Chan et al., 2017; Okumus et al., 2019). As a result, it can be challenging for people to be aware of ecological problems and how their actions may affect the ecosystem if they lack ecological awareness. Numerous researches have demonstrated that environmental behaviour is a precursor to ecological learning. Okumus et al. (2019) evaluated the effects of learning, consciousness, and care, three major mentality factors, on staff members' environmental behaviour in hospitality.

The results demonstrated that workers' intentions to adopt green practices and their environmental behaviour were highly influenced by their ecological learning. Chan et al. (2017) revealed that the mediated impact of environmental behaviour on the same three major mentality factors had considerably influenced workers' desire to adopt green activities. The two researches mentioned above provided two types of E-PEB. Whereas the goal to adopt green practices was a societal activity, environmental

conduct was a personal or individual act. Fryxell and Lo (2003) demonstrated that in addition to outward conduct, ecological understanding and beliefs influenced Indonesian executives' behaviour. Moreover, Su et al. (2018) emphasized that participants should enhance and safeguard location values (For instance, financial, societal, ecological, and aesthetic concerns. Kelly et al. (2007) claimed that societal and ecological responsibilities impacted travellers' attachment to the area.

Fatma et al. (2016) constructed three subdimensions (ecological, societal, and financial) to gauge how tourists feel about business environmental obligations in the travel and tourism sector. Even though the measures were primarily created for destinations' social accountability (DSA) of visitor attractions, visitors might use them to evaluate DSA operations in such locations. Additionally, the DSA literature primarily concentrates on several DSA results, such as target repute (Fatma et al., 2016) and ecological accountability. Su et al. (2018) claimed that few studies had examined the financial, sociocultural, and ecological facets of DSA and how they affect the results of DSA. As a result, by considering the sociocultural sociocultural, financial, and ecological factors of DSA, the present study expands the DSA writings.

2.1. Theoretical research framework

2.1.1. VBN theory

Value-Belief-Norm theory (VBN) by Stern (2000) established an integration between the value theory by Schwartz (1977) and the stereotype content model. According to VBN theory, Peter has adopted eco-friendly behaviours in that the extent to which individuals engage in environmental conservation or degradation can be attributed to values, environmental worldview, and norm activation. Stern identified values supported by an environmental perspective of the world and three variables of the norm activation model as switching factors to behaviour with a positive environmental impact. Therefore, applying the VBN hypothesis, pro-environmental behaviour stems from pro-social norms, which lie in the sphere of belief called an environmental worldview. Hypothesized norms are promoted more precisely by enhancing standards for behaviours specified to be biosphere, ethical or egocentric (Schwartz and Bilsky, 1990).

From another perspective, ideas comprise three essential components: knowledge and beliefs about the environment, impact awareness and responsibility (Chou, 2014). In prior studies, VBN theory has helped understand why visitors act in a way that is environmentally sustainable and why they decide to travel (Denley et al., 2020), engage in nature-based travel (Kim and Hyun, 2021), have intentions to travel (Gond et al., 2017), and visit sustainable tourism heritages (Denley et al., 2020). VBN stands for Values, Beliefs, and Norms, and in the context of tourism, it states that tourists' values, beliefs, and emotions determine their behaviours towards the environment (Kim and Hyun, 2021). In the context of Bali, while many tourists are aware of the natural environment in Bali, we predict that the tourists who care about the ecosystem and have a high level of sustainable cognition will likely perform ecological behaviour. This theory explains how tourist values and beliefs that dictate the choice of conduct in different spheres transform into environmentally friendly behaviour in Bali, which is specific in geography and culture.

2.1.2. Nudge theory

As applicable to examining values, understanding and feelings of subjects engaging in ecological activities, VBN theory has some limitations regarding the effects of the ecological conditions caused by outside factors (e.g., operators of areas of interest of tourism and tourist entities). In order to manage this, we adopt the nudge theory by Richard Thaler to show the relationship between Destination Social Accountability (DSA), prior knowledge of travelling to environmental places, and tourists' ecological behaviours. Nudge theory illustrates that one must guide people's choices by suggesting which option to choose without limiting the freedom of choice or applying pressure to make certain decisions (Marjanovic, 2017). This theory maintains that non-forceful yet impactful approaches can be far more utilized than traditional mechanisms such as instruction or legal aid in changing conduct. An example of a nudge in tourism can be associated with the reminding or information sign blinking people to act in an environmentally sustainable manner. Walking past these cues, such as DSA, causes a perception of tourists and might increase their likelihood of behaving responsibly in future.

Herd behaviour has embraced the nudge theory in many fields, such as the healthcare sector, trade, finance, and government, to trigger a behaviour change (Cai, 2020). In the past few years, it has also been applied to predict pro-environmental actions in the tourism field. For instance, Kim and Hyun (2021) used the nudge concept to analyze how ecological taxes in aviation promote environmentalism. Sharma and Gupta (2020) proposed using cognitive psychology nudge theory as a strategy for creating frameworks by which the ecological activities of locals in historical sites can be predicted. From the above-discussed literature, the research questions are: In this study, we propose the following theoretical frameworks to explain the seeming relationship: General, Ecological, Personal, Social and Financial obligations by Touristic organizations or biosphere values held by visitors as postulated by VBN theory, and Sustainability cognition and travellers' knowledge on travel destinations by use of nudge theory. Hence, the following research objectives are posited: The integration of these theories is expected to offer a practical approach to understanding the determinants of environmentally sustainable behaviour among the various stakeholders within Bali's tourism industry.

3. Methodology

3.1. Study site

Bali Island, in the east of the Java state, Indonesians enjoy rich cultural importance as a tourist destination. The Balinese people show their closeness with the people of the Indonesian archipelago, Malaysia, Brunei, the Philippines and Oceania. Balinese tourism began gradually with the establishment of the Bali Beach Hotel in 1963 and following the launching of Ngurah Rai International Airport in 1970 (Cremers, 1999). The service sector encompasses the tourism industry, mainly in the southern area, with famous areas such as Kuta, Legian, Seminyak, Sanur, Ubud, Jimbaran, Nusa Dua, and Pecatu. This study completed a cross-sectional online and offline survey of 500 employees from the tourism sector of Bali Island and the gateway

area. The surveys sought to determine how the behaviour of the two destinations of the high and low DSA groups and social accountability differed. The study site selection was essential as Bali is a tourist hotspot and faces environmental issues in the context of ecological tourism. This justifies the reason for conducting this research on the Eco-FB of local people and tourists.

3.2. Data collection

Tourists to Bali Island participated in a study that was performed there. At the Wetland Environmental Institute and the other locations, two field researchers approached potential responders and explained the study's goal. Participants got a self-administered survey after agreeing to participate in the study. The survey was disseminated using an easy sampling technique. Five hundred tourists were given the questionnaire form; 470 replies were obtained, yielding a participation percentage of 94.0 percent. Four hundred fifteen samples were available for analysis after 55 samples were eliminated due to absent and partial replies. As a result, the genuine number of responses was 83.0%, while the range of the actual response rate's 95 percent standard error was discovered to be between 79.4 percent and 86.6 percent.

3.3. Analysis procedure and measurement

Four phases of the data analysis techniques are explained. First, confirmation factor analysis was used in this work to assess the validity of the measurement model (CFA). Additionally, cluster analysis was used to categorize visitors depending on DSA. Thirdly, ANCOVA was used to investigate if ecological activity varied among DSA clusters after adjusting for other factors. The impacts of DSA clusters, biocentric values, sustainability cognition, and trip pleasure at tourist places on ecological activity were investigated using GLM. The data for this investigation were examined utilizing Amos 23.0 SPSS 23.0.

This research created a list of measuring objects from the associated field. Three aspects of DSA were measured using four objects each (i.e., the ecology, society, and economy), that was modified from earlier studies (Fatma et al., 2016; Stern, 2000). Furthermore, four items modified from earlier studies were used to evaluate the biocentric value (Chan et al., 2017; Gond et al., 2017). Next, four questions were developed and used to measure sustained ability (López-Sánchez and Pulido-Fernández, 2016). Moreover, ecological activity was evaluated utilizing four elements modified from earlier studies by Su et al. (2018). A subjective score of five (1 = strongly disagree and 5 = strongly agree) was employed to rate the test items.

To ensure the measurement items were suitable for the wetland setting, we consulted two tourism academic experts who reviewed the items for topic relevance. Their feedback was instrumental in refining our survey. Specifically, the experts highlighted areas where the items could be more contextually appropriate for wetlands. For example, the questionnaire regarding tourists' prior ecological activity knowledge was revised to include more specific examples relevant to wetlands. Additionally, statistical inquiries like wealth were redefined to represent better tourists' factual data pertinent to the wetland context. A pre-test was conducted with ten participants—four graduate students, four tourism executives, and two tourists. This pre-test helped

clarify any remaining unclear items. Based on the feedback, we made further adjustments to ensure the survey items were clear and relevant. These steps ensured that the final survey was accurate and comprehensible, providing reliable data for our study.

4. Results and discussion

4.1. Characteristics of respondents

Table 1 shows more female responses than male participants (58.1 percent vs. 41.9 percent). 43.8 percent of the participants were between the ages of Twenty and Thirty-Nine, following those between the ages of Forty and Forty-Nine (31.1 percent) and those over Fifty (25.1 percent). 66.5 percent of participants have an undergraduate or graduate degree. Then, the 3–5 million KRW (Korean Won) per month family income dominated (42.7 percent), followed by the over 5 million KRW (30.3 percent) range. Over two-thirds of the participants (66.3 percent) were joined by families and friends, and coupled participants predominated (79.8 percent) compared to single respondents (20.2 percent). Internet/Social Network Services (SNS) and word-of-mouth (34.2 percent) were the two primary data resources on Bali Island, respectively (30.6 percent). Earlier, 77.3 percent of the participants had toured eco-friendly tourism destinations.

Table 1. Characteristics of the respondents.

Factor		**N (%)**	**Factor**		**N (%)**
Gender	Male	174 (41.9)	Marital	Single	84 (20.2)
	Female	241 (58.1)	status	Married	331 (79.8)
Age	18–30	170 (43.8)	Companion	Family/Friends /relatives/	275 (66.3)
	31–50	141 (31.1)		Others	140 (33.7)
	51 and above	99 (23.1)	Information	Word of mouth	142 (34.2)
Education	High school or less	104 (25.1)	sources	Internet/SNS	127 (30.6)
	College/university	276 (66.5)		Magazine/Newspaper/ Radio/T.V.	96 (23.1)
	Graduate school	43 (10.4)		Others	50 (12.1)
Monthly	Less than 3 million IDR	112 (27.0)	Visit experience environmentally	Yes	321 (77.3)
Household	3–5 million IRR	177 (42.7)	friendly tourist sites	No	94 (22.7)
Income	Over 5 million IDR	126 (30.3)			

4.2. Measurement model

The data are well-fitted in **Table 2**: χ^2 (235) = 455.799 ($p < 0.001$); χ^2/df = 1.945; GFI = 0.914; NFI = 0.928; TLI = 0.957; CFI = 0.964; RMSEA = 0.049 (Ozaki, 2011). The component tonnages varied from 568 to 902, with maintenance complete at $p <$ 0.001, confirming composite reliability.

Norton et al. (2015) and average variance extracted (AVE) values that were more than 6 (Schwartz and Bilsky, 1990). Additionally, the composite reliability (C.R.) and Cronbach's alpha values are both above the corresponding limit levels of 7 (Wu et al., 2013).

Table 2. Results of CFA.

Items for the measurement	Factor-loadings
Eco-Friendly Behavior (Prakash et al., 2019) AVE: 0.642, C.R.: 0.923, Cronbach Alpha: 0.912	
1. I follow rules to preserve Bali Island's environment.	0.733
2. If I spot trash at Bali Island, I dispose of it properly.	0.567
3. I urge partners to preserve Bali Island's natural environment.	0.774
4. I avoid disrupting Bali Island's ecosystem during my visit.	0.824
Green Intelligence (Rebollo and Baidal, 2003). AVE: 0.635, C.R.: 0.786, Cronbach Alpha: 0.795	
1. Green is crucial for Bali Island ecotourism.	0.718
2. I aspire to support greenery while sightseeing on Bali Island.	0.793
3. I aim to fund Bali Island's transition into a green tourist spot.	0.604
4. I am exploring Bali Island as a green tourist spot.	0.743
Ecological Value (Ruepert et al., 2017). AVE: 0.684, C.R.: 0.896, Cronbach Alpha: 0.904	
1. Valuing the planet: Live in harmony with other living beings on Earth.	0.824
2. Integration with nature: assimilate into the natural environment.	0.901
3. Conservation of the ecosystem: safeguard the natural world.	0.817
4. Halting contamination: shielding natural resources from pollutants.	0.759
Financial Accountability (Alvarado-Herrera et al., 2017) AVE: 0.656, C.R.: 0.910, Cronbach Alpha: 0.902	
1. I believe Bali Island's tourism organization strictly controls its costs.	0.689
2. Bali Island's tourism organization aims for survival and long-term success.	0.84
3. Bali Island's tourism organization strives to improve its economic performance.	0.86
4. I believe Bali Island's tourism organization strongly supports the local community.	0.84
Sociocultural Sociocultural Accountability (Shin et al., 2007). AVE: 0.623, CR: 0.868, Cronbach Alpha: 0.868	
1. The Bali Island tourism organization strives to improve community well-being.	0.803
2. The Bali Island tourism organization fairly treats their stakeholders.	0.766
3. The Bali Island tourism organization provides tourists with authentic experiences by connecting them with locals and promoting local culture.	0.803
4. The Bali Island tourism organization supports addressing sociocultural sociocultural problems.	0.784
Environmental Accountability (Shin et al., 2007). AVE: 0.569, C.R.: 0.841, Cronbach Alpha: 0.839	
1. Bali Island's tourism considers the environment.	0.719
2. Bali Island's tourism saves natural resources.	0.746
3. Bali Island's tourism communicates eco-friendly practices.	0.768
4. Bali Island's tourism protects the natural environment.	0.782

Note: Those indicators fixed at 1 for identification were not evaluated by *t*-values in each construct. The research study yielded significant findings, with a *p*-value of less than 0.001.

While the C.R. (Composite Reliability) and AVE (Average Variance Extracted) values for most constructs are satisfactory, the divergent validity among some constructs such as Sociocultural Accountability (S.C.), Financial Accountability (F.A.), Green Intelligence (G.I.), and Eco-Friendly Behavior appears inadequate. This lack of divergent validity indicates that the constructs may not be distinct and could overlap in what they measure. Future research should consider refining the measurement items or employing more robust statistical techniques to distinguish these constructs better. Additionally, conducting exploratory and confirmatory factor analyses in different contexts or with larger sample sizes could help improve the

constructs' divergent validity. This will enhance the reliability and validity of the findings and provide more precise insights into the factors influencing eco-friendly behaviour in tourism settings.

According to **Table 3**, four association factors were more than the square root of AVE. As a result, we evaluated the inter-factor correlation's sampling error Schwartz and Bilsky (1990). When the relationship between two factors is not included in the 95 percent standard error, analytic relevance is verified Anderson and Gerbing (1992). For instance, the 95 percent standard error for the most vital relationship between ecological accountability and sociocultural accountability (r = 0.845) is between 0.751 and 0.939, confirming the reliability of the classifier.

Table 3. Correlations, square root of AVE.

Variables	En-ACC	SC-ACC	F.ACC	Eco. V	G.I.	Eco-FB
Environmental accountability (En. A.C.)	0.754					
SocioculturalSociocultural accountability (SC-Res)	0.845***	0.789				
Financial accountability (F.A.)	0.769***	0.818***	0.810			
Ecological Value (E.V.)	0.403***	0.381***	0.428***	0.827		
Green intelligence (G.I.)	0.562***	0.510***	0.586***	0.604***	0.718	
Eco-friendly behaviour (Eco-FB)	0.570***	0.515***	0.547***	0.610***	0.764***	0.731

Note: *, **, *** means at the 10%, 5%, and 1% significant levels, respectively.

The square root of AVE, the figures in the parentheses represent 95% confidence intervals of correlation, and the values beneath the square root of AVE show correlations. The study's results were highly statistically significant, with $p < 0.001$. **Figure 1** shows the heatmap of the correlation matrix.

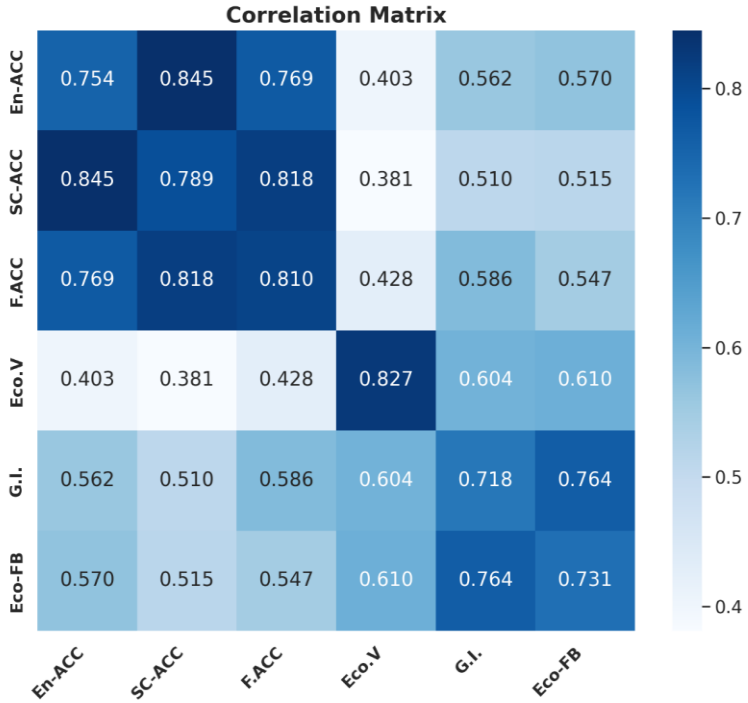

Figure 1. Heatmap of correlations.

4.3. Segmenting visitors by using DSA

This study's clustering algorithm used the Ward technique and the K-means process to divide data into locally incompatible sections. The hierarchical clustering findings showed two suitable cluster options (**Table 4**). Non-hierarchical clustering that uses the K-means approach was used to classify the two clustering: reduced DSA group (N = 187, 35.2%) and high DSA group (N = 228, 55.6%) 416 responders, as of. According to multivariate ANOVA, two DSA clusters were distinguished from DSA components with a substantial variance ($p < 0.001$), demonstrating that distinctive clusters were found.

Table 4. DSA cluster evaluation results.

Variable		Environmental accountability	Sociocultural Sociocultural accountability	Financial accountability
Cluster I (N = 221, 39.1%)	Low DSA group	2.99 (0.49)	2.97 (0.47)	2.96 (0.48)
Cluster II (N = 245, 60.9%)	High DSA group	3.89 (0.54)	3.96 (0.57)	3.99 (0.58)
F-value		501.219***	502.201***	3.97.995***
Test of Multivariate	Wilks' Lambda = 0.404*** Pillai's trace = 0.597***.			
	Roy's greatest root = 2.005***			
	Hotelling–Lawley trace = 2.004***.			

Note: The significant value $p < 0.001$. was represented by (***).

A classification technique was carried out using two groupings and the DSA components to verify the DSA clusters. The collection was split into two using a simple random process (Ozaki, 2011). According to **Table 5**, the regression model correctly identified the divided-in-half sample: In the holdout sample, 97.1 percent (N = 207) and 99.5 percent of the N = 208 analytical sample. Additionally, 99.0 percent of participants and 99.0 percent of the cross-validated subgroups for the overall sample were properly categorized by this research. **Figure 2** shows the comparison of DSA Groups Across Accountability Metrics.

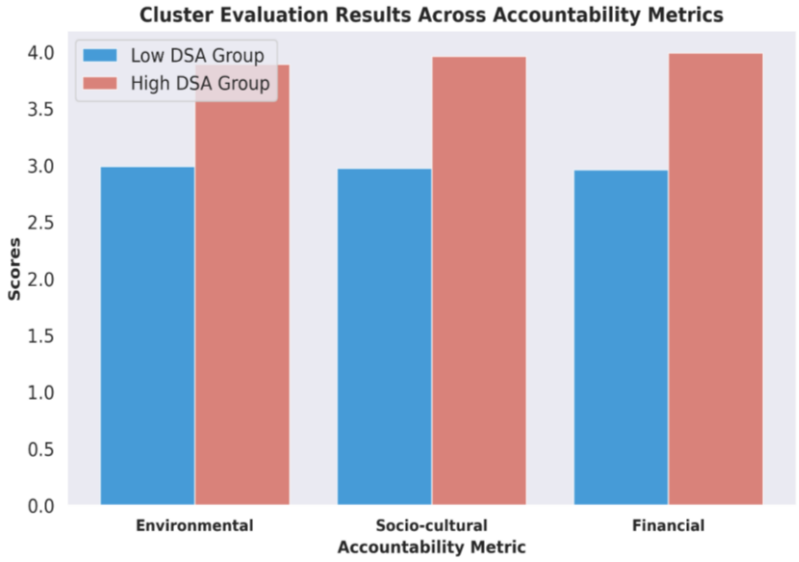

Figure 2. Comparison of DSA groups across accountability metrics.

Table 5. DSA discriminant analysis.

Sample	**Analysis sample**	**Holdout sample**	**Whole sample**	**Sample**		**Analysis sample (*N* = 208, 50.1%)**		**Holdout sample (*N* = 207, 49.1%)**		**Whole sample (*N* = 415, 100.0)**	
Function	1	1	1								
Eigenvalue	1.905	1.695	1.77	Clusters		Low DSA	High DSA	Low DSA	High DSA	Low DSA	High DSA
% of variance	100	100	100	Predicted group membership	Low DSA	93 (100.0%)	1 (0.9%)	94 (100.0%)	6 (5.3%)	187 (100.0%)	4 (1.8%)
Canonical correlation	0.81	0.793	0.799								
					High DSA	0 (0%)	114 (99.1%)	0 (0%)	107 (94.7%)	0 (0%)	224 (98.2%)
Wilks' lambda	0.344	0.371	0.361								
χ^2	218.065***	201.731***	419.206***	Total		93 (100.0)	115 (100.0%)	94 (100.0%)	113 (100.0%)	187 (100.0%)	228 (100.0%)
df	3	3	3								

Note: The analysis sample hit ratio was a remarkable 99.5%, with the cross-validated ratio not far behind at 99.0%. The results were highly statistically significant, with a *p*-value < 0.001 (***).

4.4. Results of ANCOVA

ANCOVA was used to examine if the two DSA groups differed in their pro-environmental activity. (low and high DSA) after adjusting for ethnic and essential feature factors, sustained cognition, and biocentric worth. The ANCOVA analysis shows that the pro-environmental activity variable was significantly relevant among the low and high DSA groups at $p < 0.001$, even after considering sustained intellect, generalized demographics, and biocentric worth (**Table 6**) and **Figure 3** shows the Scatter plot of discriminant analysis for DSA cluster. Visits to ecologically friendly tourism destinations were significantly relevant at $p < 0.05$. Biocentric significance and ecological cognition were statistically significant at $p < 0.001$. This result suggests that people with significant ecological attitudes probably have biocentric worth, sustainability cognition, and travel experiences.

Table 6. DSA discriminant analysis.

Model/predictor	**Sum of square**	**df**	**Mean square**	***F*-value**	***p*-value**
Corrected Model	83.596	16	5.225	21.028	0.000***
Error	98.891	398	0.248		
Total	7475.813	415			
Covariates					
Ecological value	7.921	1	7.921	31.878	0.000***
Green Intelligence	15.28	1	15.28	61.494	0.000***
Ecotourism destinations for sustainable travel. (no[a])/Yes	1.339	1	1.339	5.39	0.021*
Gender (male)/Female	0.204	1	0.204	0.819	0.366
Age (18–30 years old)/31–50	0.35	1	0.35	1.408	0.236
Older than 50	0.565	1	0.565	2.273	0.132
Education (Less or high school) University/College	0.73	1	0.73	2.938	0.087
Graduate School	0.616	1	0.616	2.478	0.116

Table 6. (*Continued*).

Model/predictor	Sum of square	df	Mean square	*F*-value	*p*-value
Per Month Income Monthly income (less than 0.3 million Yuan) 0.1 to 0.3 million Yuan	0.522	1	0.522	2.101	0.148
Over 50.5 million Yuan	0.297	1	0.297	1.196	0.275
Marital status (single)/Married	0.007	1	0.007	0.027	0.869
Companion (others)/Family/relative	0.001	1	0.001	0.004	0.952
Source of information (others)/WOM	0	1	0	0.001	0.981
Internet/SNS	0.022	1	0.022	0.09	0.765
Magazine, Newspaper, Radio, TV	0.039	1	0.039	0.157	0.692
Main effect					
DSA clusters	4.324	1	4.324	16.856	0.000***

Note: The analysis sample hit ratio was a remarkable 99.5%, with the cross-validated ratio not far behind at 99.0%. The results were highly statistically significant, with a *p*-value < 0.001 (***).

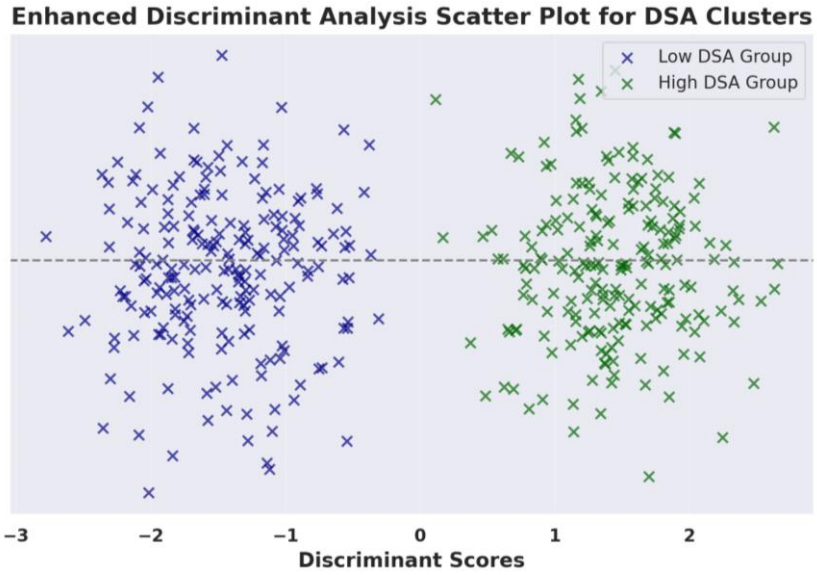

Figure 3. Scatter plot of discriminant analysis for DSA cluster.

Note: The dependent variable was how many people acted eco-friendly. The model explained 45.8% of the variation in this variable and 43.6% after adjusting for other factors. The reference variable was a group with low DSA scores (average = 3.88, standard deviation = 0.70). The other group had high DSA scores (average = 4.45, standard deviation = 0.50). DSA stands for dispositional self-regulation2. The high DSA group had significantly Eco-friendlier behaviour than the low DSA group (*$p < 0.05$, ***$p < 0.001$).

4.5. Results of GLM

We used GLM to add ANCOVA, controlling for ecological value, green intelligence, and place-visiting experiences. GLM allows us to examine the impacts of DSA, ecological value, green intelligence, and visiting experiences on eco-friendly behaviour. Exp (B) was also calculated for each factor to display the level of influence.

Overall, the GLM results support H1 by asserting that there is a positive relationship between the activity of an ecology and the value of that ecology (**Table 7**). More specifically, while contrasting between the high DSA group and the low DSA group, the former displayed a '1'. Hence, the measured values show that the high DSA group is 282. 85 times more influential regarding ecological value than the low DSA

group. This means that the participants in the high DSA group attach higher significance to ecological values or forces, which would translate as more environmentally friendly behaviour, hence supporting H2.

Table 7. DSA discriminant analysis.

Dependent variable: Eco-friendly behaviour		**(Intercept)**	**High DSA group**	**Ecological value**	**Sustainable intelligence**	**Ecotourism destinations for sustainable travel**
B		1.086	0.225[a]	0.249	0.413	0.154
S.E.		0.21	0.06	0.05	0.05	0.059
Parameter estimates	Wald's χ^2	26.631	16.543	30.494	71.039	6.776
	p-value	0.000***	0.000***	0.000***	0.000***	0.009**
	Exp(B)	2.962	1.253	1.283	1.512	1.167
	95% CI	1.961–4.475	1.124–1.396	1.174–1.401	1.373–1.664	1.039–1.310
Goodness of Fit	Likelihood ratio χ^2 = 241.703***					
	Pearson's χ^2 = 102.916 (χ^2/df = 0.249)					
	Log-likelihood = −299.529					
	Akaike's information criterion (AIC) = 599.672					

Note: [a] = We divided the participants into two groups based on their DSA scores. DSA stands for dispositional self-regulation1. The low DSA group had a score of 0, and the high DSA group had a score of 1. We also asked them if they had visited the Bali Island before. The answer was either No (0) or Yes (1). We calculated the confidence interval (CI) for each group at a certain level of probability2. The CI is a range of values that likely contains the actual value of an unknown parameter3. We found that the high DSA group and those who had visited Bali Island before had significantly higher scores on some variables than the low DSA group and those who had not visited Bali Island before (**$p < 0.01$, ***$p < 0.001$).

Moreover, the subjects in the high DSA group used the number 1. She also mentioned that generalized self-schema has a 253 times greater impact on eco-friendly behaviour than the low DSA category. This implies that a higher level of social responsibility in a given destination promotes appropriate behaviour, especially in environmental conservation among tourists. Investor Green's intelligence boasted fairness in environmental accountability, thus supporting H3. For instance, greater green intelligence and a consciousness level relating to environmental concerns led to a higher propensity to take environmentally friendly actions, such as a sample tourist, to avoid littering. In concrete terms, this suggests that promotional prompts or sensitization messages regarding environmental conservation that tourists in Bali Island might encounter could adequately influence their pro-environmental behaviour. The non-accelerated cluster shared a 1. This indicates that the Community group had 512 times the influence in eco-friendly behaviour than the lower DSA group, further stressing the significance of social accountability towards sustainable tourism practices.

Regarding the argumentative support of H4, we can identify that the positive impacts of environmentally sustainable tourism sites on ecological value constitute a viable argument for the abovementioned hypothesis. For instance, the strong DSA group managed a mean daily encounters per patient of 1. This group has been proven to have a 167 times greater influence on ecological value than the low DSA group. This suggests that encountering environmentally friendly locations creates positive feedback on tourists' participation in environmentally healthy practices, encouraging

sustainable behaviour. In conclusion, these studies imply that raising tourists' green knowledge and fostering voice norms in tourist destinations can raise sustainable behaviour in tourist places. In the case of Bali Island, efforts such as eco-education programs, practices in sustainable tourism and the community's involvement in advocating for environmental conservation could help enhance the prospects of a more sustainable form of tourism. In conclusion, the high DSA group was more impacted by ecological value, green intelligence, and visiting experiences than the reduced DSA group was. Among the various factors, green intelligence is the most affected by ecological value. **Figure 4** indicates the model fit and showing the supported hypothesis.

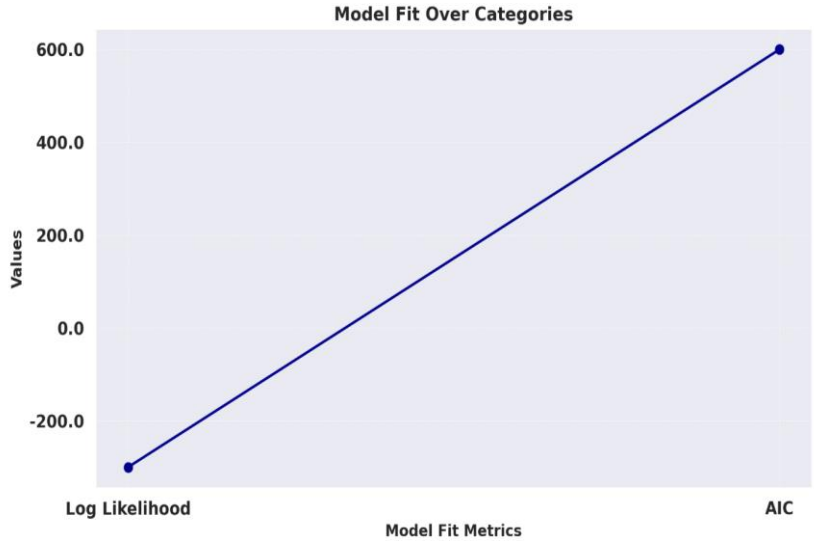

Figure 4. Model fit evaluation over time.

5. Discussions and implications

In order to provide a study model for evaluating the effects of DSA, ecological value, green intelligence, and visitor experiences on ecological value at Bali Island as an ecotourism area, this approach incorporates the nudge concept with the VBN theory. While the VBN theory has been applied to enhance people's ideas and impressions of their ecological values (Bamdad, 2019; Luu, 2019; Rezapouraghdam et al., 2018), Due to other participants' activation of ecological variables like DSA, they were unable to record their impacts correctly (e.g., tourism organizations and administrators for ecotourism). Therefore, our work addressed the data vacuum using a nudge model to establish associations between nudging variables and tourists' ecological values. All major player categories, especially tourists and travel administrators, must participate in the responsible administration of environmental destinations; according to Cai (2020), the Nudge model may explain how and why tourist organizations' and environmental site administrators' responsibility activities (DSA) can influence tourists' ecological value.

DSA is a crucial idea in ecological locations that allows participants to reduce adverse ecological value effects and offer financial and societal advantages for the regional population (Suganthi, 2019). Tourism activity locations rely heavily on participants' DSA activities, which impact the location's ecology and ecological

activity (Su et al., 2018). Cooperation from travellers is crucial for effectively administrating ecological locations (AlSuwaidi et al., 2021; Luu, 2020) if they are ready to act environmentally friendly.

Furthermore, according to the societal interaction model, DSA groups might reach various conclusions based on their perception of whether their anticipated advantages outweigh the costs (Su et al., 2018). Based on market categorization, Katircioglu et al. (2014) claimed that high and low environmentalists had different views and behavioural intentions. In certain studies, certain groups were chosen for the safer conservation of ecotourism destinations using the marketplace segment strategy (Marjanovic, 2017; Wang et al., 2020). Tourism administrators worry about which DSA groups more effectively exhibit environmentally friendly activity to protect their tourism locations. More studies in the DSA setting need to focus on segmenting the market. This research aimed to narrow this gap by segregating DSA groups and comparing how each group behaved in favour of the ecosystem. Following the market segmentation, DSA was divided into high and low categories. Then, this study used ANCOVA, which permits researchers to control other potential impacting factors on the variations to analyze distinctions in ecological activity among the two groups. After adjusting for biosphere value, green intelligence, demographic and general characteristic factors, the ANCOVA findings showed a significant difference in ecological activity among the high and low DSA categories.

Additionally, the high DSA team's average value is more significant (M = 3.88) than that of the low DSA group (M = 4.45). The fact that the significant ecological mindset category had much greater attitudes and intentions than its opposite supports the findings of Wu et al. (2013). The results of this study give location administrators helpful information they can use to effectively market the favourable financial, societal, and ecological consequences to a particular sector.

According to Stern (2000), ecological value is connected to the natural world and the ecosystem, which is enhanced through ecological activity. Tourists' self-identity and social desire to participate in ecological actions are influenced by the ecological value of the area (Katircioglu et al., 2014). Green intelligence is the capacity to use expertise and experiences to exhibit active participation in tourism development (López-Sánchez and Pulido-Fernández, 2016). Therefore, different individuals' ecological activity is linked to biocentric significance. Even though numerous research on DSA and ecological activity were undertaken (Chan et al., 2017; Su et al., 2018), DSA was unclear how biocentric significance and ecological cognition affected ecological activity for ecological sustainability. In order to close the gap, our research examined how these characteristics related to ecological activity. The GLM analysis indicates that DSA clusters, biocentric significance, sustainability cognition, and visiting experiences substantially impact ecology, with the high DSA group exhibiting more ecological actions than the low DSA group. The results imply that tourism administrators should consider these factors while creating sustainable ecological tourism plans. Among the other factors, sustainability cognition had the most significant influence on ecological activity. This study also has ramifications for how sustainability information should be considered for more ecological sustainability of ecotourism provided by academics and operators.

5.1. Theoretical implications

This study advances our understanding of the tourist industry by using the nudge and VBN theories to forecast tourists' ecological activity. Framework, for example, validates this research's findings since DSA, with green intelligence, environmental significance, and visiting experiences, impacted tourists' ecological activities at environmental sites. Tourists with high environmental significance and green intelligence, according to VBN theory, would participate in pro-environmental acts. The responsibilities of tourist organizations and administrators can also function as a nudge that increases tourists' ecological activities in addition to how visitors perceive their part in the process. Notably, users who had previously visited the site indicated being more interested in pro-environmental activity. These results demonstrate the significance of individual and ecological cues in shaping tourists' Eco-friendly behaviours at tourist locations.

Gond et al. (2017) emphasized that DSA offers tourist organizations economic benefits and development. DSA also safeguards tourist places' rights regarding humanitarian and ecological concerns. There has only been a little study on DSA related to ecological activity. In this way, the current study adds to the body of knowledge on environmentalism by examining how DSA organizations' influence on ecological activity varies in tourist spots. The findings of this study showed that, after controlling for biocentric significance, sustainability cognition, and socioeconomic characteristics, ecological activity is significantly distinct among the low and high DSA groups. This research shows that highly regarded DSA groups are more likely to exhibit significant ecological activity than their counterparts. This finding shows that DSA can forecast tourists' ecological activity from an ecological, sociocultural, and financial standpoint.

Investigating how biocentric richness affects ecological activity at touristic locations adds to the body of knowledge on tourists. The findings of this study demonstrated that biocentric significance has a considerable impact on ecological activity. The findings align with research by Wu et al. (2013), which discovered a link between ecological self-identity and egocentric significance and claimed that biocentric significance supports tourists' involvement in ecological behaviour. Furthermore, Zientara and Zamojska (2018) pointed out that customer attitudes towards ecological activity are influenced by biocentric significance. According to the research findings, biocentric significance significantly predicts ecological activity in tourist destinations.

This research suggests that it is essential to foresee tourists' upcoming worries concerning their ecological activity by considering their engagement in sustainability cognition and eccentric significance. When DSA is strong in touristic destinations, tourists' attitudes toward engaging in environmentally friendly activity are translated by biocentric significance. Similarly, De Roeck and Delobbe (2012) stated that self-identity promotes ecological activity through influencing attitudes. The significance of cognitive intent in explaining ecological activity was underlined by De Roeck and Delobbe (2012). There has yet to be a study on sustainability cognition and ecological behaviour. As a result, this study adds to the body of knowledge about tourism by examining the influence of sustainability cognition on ecological behaviour in tourism

sites. This study's findings showed that sustainability cognition significantly impacts ecological activity. Notably, among DSA, biocentric significance, and visiting experiences, sustainability cognition was revealed to have the most influence on ecological activity. This research adds to the body of research on ecotourism by demonstrating that sustainability cognition should be a critical factor in identifying ecological activity at tourism destinations.

Last but not least, travellers' experiences at environmental locations affect their ecological activity (Lo et al., 2012; Norton et al., 2015). This indicates that encouraging visits to ecologically friendly locations may aid in preserving national historical monuments. Additionally, they argued that tourists' regionally particular ecological behaviour might impact their overall ecological behaviour. This study adds to the body of knowledge by examining whether visiting tourism locations affects ecological behaviour. The findings of this study showed that visitor experiences have a significant impact on ecological behaviour. This result indicates that visitation experiences significantly predict ecological behaviour in ecotourism destinations. In conclusion, tourists in the high DSA group with more ecological activity than their equivalent will likely have higher sustainability cognition, biocentric significance, and trip experiences at eco-friendly tourism locations.

5.2. Practical implications

Hence, the following are the study's practical implications for tourism management and marketing, significantly stimulating ecological actions from tourists. First, the segmentation of the results revealed that the high DSA (Destination Social Accountability) category is much more ready to perform ecological activity than the low DSA class. Consequently, tourism marketers should concentrate on this segmentation when advertising ecological go locations. The findings suggest that marketing campaigns should emphasize and commit to preserving conservation and sustenance to target and appeal to the high DSA group. Furthermore, while developing the tourism plan, the high DSA group members were recommended to be appointed as the public relations personnel. Such people can influence international tourists to embrace sustainable practices through interpersonal communication, expressing their willingness to embrace them during their touristic exploits. Secondly, regarding tourism management, it is crucial to develop marketing strategies that effectively strengthen DSA recognition among all the stakeholders operating in the area, mainly prospective and current visitors. For example, proving responsibility by presenting the benefits of tourism in any area and presenting a positive impact on the welfare of local citizens can improve the perceived image of DSA among tourists. Emphasizing the places' attempts to retain indigenous cultures and customs may lead to establishing effective links for tourists. This can be done by exchanging and sharing cultural practices with the local communities. Consequently, stressing on-call environmental protection, including the efforts made to cut down on the usage of natural resources or the protection of various ecosystems, can contribute to raising the level of understanding of the method among the public. Touristic organizations could put into place video theatres that feature current promotional campaigns, such as those conducted by DSA headed for Bali's wetland and why sustainable practice is essential.

Thirdly, this study's findings aligned with the hypothesis that ecological activity is affected by sustainability cognition. Sustainability cognition has the most decisive influence on the ecological activity of these seven precursors. As a result, tourism management should create educational programs to update visitors' knowledge and cognition regarding ecological sustainability. They are as follows: Developing V.R. programs that allow visitors to experience how tourism destinations have adopted sustainability measures and promote ecological literacy. These V.R. experiences can be marketed on Facebook and other social media to enable them to reach the intended audience.

Further, arranging various workshops on sustainable tourism practices may enable the generation of practical learning sessions for tourists, which may craft and enable the conservation of natural resources. Fourth: Since bio-centric importance is closely associated with ecological functioning, tourism management should thus aim at preserving and maintaining biosystems and natural resources. Through its information-sharing platforms, the target visitors can be informed about the role of conservations in tourist places to make them responsible and harmonize with the environment. Engaging local guides in narrating any tourist destination's ecological significance can help garner more enthusiasm and support towards sustainability. Such narrative sessions can expose the strife of each location in terms of the conservation of the environment.

Last, the study demonstrates that previous visits to ecological sites positively influence Ecological activity. To this end, tourism operators should incorporate the following strategy: providing visitors with guided storytelling sessions by accredited environmentalists to help further them understand measures to protect the environment. To keep the tourists engaged, one could post updates on ecological actions or frequently post issues touching on sustainability in order to keep the tourists informed. It may persuade visitors to be more conscious of and engage in earth-friendly practices on their trips by showcasing successful stories and current projects.

5.3. Limitations

Firstly, various limitations of this study can suggest future lines of research. The study is restricted to Bali Island in Indonesia, while the independent variables under consideration include DSA, ecological cognition, biocentric importance, and visit experiences on ecological engagement. Given the above findings, it is recommended that future studies extend their research across cultural levels, focusing on the local and provincial levels. For example, other important tourist destinations may be studied, including Phuket in Thailand, the Maldives or the Galapagos Islands, to discover if the observed impact is valid in other cultural and ecological settings. Also, the findings of this study reveal that temporal forecasting of pro-environmental activity involves considerable continuity cognition in varying degrees. In the future, studies should further improve the performance of ecological activity by including more statistics from the use of focused interviews. Longitudinal research can also document shifts in ecological behaviour within a progression of time to try and do a profound analysis of the reasons behind sustainable tourism practices. From a methodological point of view, using a mixed-methods approach, both surveys and interviews, helped provide a

deeper understanding of the tourists and their motivations and behavioural intentions. Methodological approaches like field experiments in different tourist hot destinations can also support the evaluation of the impact of various techniques for encouraging pro-environmental practice. Thus, progressing from these limitations and integrating these methodologies, further research can be served with the conclusive outcomes of this study to advance the embodied theoretical framework of ecological concern in tourism.

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