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ADOPTING GREEN INNOVATION IN TOURISM SMES: INTEGRATING PRO-ENVIRONMENTAL PLANNED BEHAVIOR AND TOE MODEL

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ABSTRACT

Aim/Purpose	This study investigated factors influencing the intention to engage in green innovation among small and medium enterprises (SMEs) in the tourism sector, using an integrated approach from the pro-environmental planned behavior (PEPB) and technology organization environment (TOE) models.
Background	Green innovation is a long-term strategy aimed at addressing environmental challenges in the Indonesian tourism sector, especially those related to SMEs in culinary, accommodation, transportation, and creative industries. While prior research primarily focused on innovation characteristics and various behavioral intentions towards new technologies, this study pioneered an approach to understanding green innovation practices among SMEs by examining behavioral intention and the influence of internal organizational and external environmental factors. This was achieved through the PEPB model, which extends the theory of planned behavior (TPB) by incorporating perceived authority support and perceived environmental concern and integrating it with the TOE model. This comprehensive approach was crucial for understanding SME motivations, needs, and challenges in adopting green innovation, thereby supporting environmental sustainability.

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Methodology	Data were collected through offline and online questionnaires and interviews with 405 SMEs that had implemented green innovation as respondents. The theoretical model was tested using partial least squares structural equation modeling (PLS-SEM) with top-level constructs.
Contribution	This research contributed to the development and validation of an integrated model for green innovation in SMEs, offering insights and recommendations for all stakeholders in the tourism sector to formulate effective green innovation strategies.
Findings	This research revealed that the integrated model of pro-environmental planned behavior and technology organization environment successfully explained 71% of the factors influencing the intention to engage in green innovation for SMEs in the tourism sector. Perceived authority support emerged as the strongest factor, while perceived behavioral control was identified as a weaker factor.
Recommendations for Practitioners	The research findings recommended that SMEs in the tourism sector focus on customer satisfaction and operational efficiency and optimize the recruitment and training processes of resources to maximize success in adopting environmentally friendly innovations. Meanwhile, for the government, providing support, incentives, and stringent environmental regulations could encourage sustainable business practices.
Recommendations for Researchers	The integrated PEPB and TOE models offered a comprehensive approach to analyzing factors influencing green innovation adoption intention. It enhanced the literature by assessing this intention from environmental behavioral planning and organizational conditions perspectives, both internally and externally.
Impact on Society	Examining the factors influencing the intention to engage in green innovation among SMEs in the tourism sector carried significant social implications. The findings contributed to recommending strategies for businesses and stakeholders such as the government, investors, and tourists to collectively strive to minimize environmental damage in tourist areas through the implementation of green innovation.
Future Research	There are several promising avenues to explore to enhance future research. Expanding the scope to include diverse regions and industries and using additional approaches, such as leadership theory and management commitment theories, can increase the R-squared value. Additionally, broadening the profile of interviewees to obtain a more comprehensive understanding of the intention to engage in green innovation should be considered.

| Keywords | behavioral intention, green innovation, PEPB, TOE, SMEs, tourism |

INTRODUCTION

As a sector with a strategic role in Indonesia's economy, tourism faced significant challenges due to environmental issues (Arif et al., 2022). According to the Indonesian Environmental Performance Index report, the environmental performance of Indonesia's tourism sector ranks 164 out of 180 countries surveyed. Within the Asia-Pacific region, Indonesia is positioned at 22 out of 25 countries (Ahdiat, 2022). Additionally, the Travel and Tourism Competitiveness Index (TTCI) evaluated the sustainability of environmental and natural resources in the tourism sector, reflecting very low performance worldwide, with Indonesia holding the 131st position among 136 evaluated nations. This situation was primarily influenced by the business activities of supporting sectors, particularly small

and medium enterprises (SMEs) operating around tourist areas engaged in culinary, accommodation, transportation, and creative industries (World Economic Forum, 2022).

This environmental performance issue was further highlighted by the Indonesia Waste Platform's report on environmental challenges in one of Indonesia's tourist destinations, Labuan Bajo, which documented that SMEs in the tourism sector generated approximately 30 tons of environmentally harmful waste daily (Tim detikcom, 2021). In response to these challenges, integrating environmental concepts with business operations through green innovation encompassing the development of environmentally-based concepts, ideas, and business approaches was deemed crucial for every industry (Dadhich & Hiran, 2022; Y. Zhang et al., 2020).

Green innovation served as a long-term environmentally oriented strategy aimed at reducing the pollution impact of business activities on the environment through product and process innovation (Jia et al., 2017). Implementing green innovation involves adopting new or modified processes, techniques, and systems to minimize environmental impacts. Evidence showed that applying green innovation in SMEs effectively addressed environmental impacts and enhanced SME performance (Ji et al., 2023; Rustiarini et al., 2022; Singh et al., 2022). In the context of tourism-focused SMEs, green innovation is manifested through various environmentally friendly practices. For instance, using lontar leaves in accommodation design, employing energy-efficient lighting, and utilizing solar water heaters helped reduce excessive energy consumption. Incorporating organic food materials from local farmers, who avoided pesticides and chemicals, not only enhanced the quality of food but also supported sustainable agriculture. However, it is important to note that using organic ingredients might have increased the cost of food for consumers, as organic farming often involves higher production costs. Conversely, this practice provided financial benefits to local farmers by offering them a stable market and potentially higher prices for their produce. Additionally, avoiding disposable tools and materials in food presentation and using natural materials in the production of creative products or through recycling processes contributed to reducing overall environmental impact and supported sustainable business practices.

Research related to green innovation was conducted, including T. K. C. Nguyen (2022), which explained that personal concern for environmental challenges drove individuals to engage in green innovation. Meanwhile, Dadhich and Hiran (2022) summarized the factors influencing corporate environmental sustainability and its relationship with operating performance, indicating that the direct economic benefits of implementing green innovation made it an alternative choice for companies. Another study by H. M. Nguyen et al. (2022) analyzed the significant influence of technological factors, namely compatibility, simplicity, and relative advantages, on the adoption of green innovation in the manufacturing sector in Vietnam. The alignment of innovation with values in manufacturing business practices and the perceived ease and benefits of green innovation motivated manufacturing sector companies to adopt green innovation. Thomas et al. (2021) summarized the influence of stakeholder support for SMEs in adopting green innovation, while Jun et al. (2021) examined factors influencing the adoption of green innovation in Pakistan, considering market and customer factors, as well as government support. Research by Zailani et al. (2015) explained the strong relationship between environmental regulations and the tendency to adopt green innovation in the automotive supply chain industry in Malaysia. This implied that previous research trends focused on analyzing green innovation practices from the perspective of innovation characteristics and their benefits.

The trend in prior research primarily focused on analyzing green innovation solely from the perspective of innovation characteristics (Jun et al., 2021; H. M. Nguyen et al., 2022; Thomas et al., 2021). Additionally, some studies examined the behavioral intention of SMEs towards the use of social commerce (Gupta et al., 2024), big data analytics (Azzam et al., 2023), and circular economy adoption (Khan et al., 2023). This study took a different approach and pioneered efforts to understand green innovation practices in SMEs from the perspective of behavioral intention, integrating this with an assessment of the influence of internal organizational and external environmental factors. This was achieved through the pro-environmental planned behavior (PEPB)

model, an extension of the theory of planned behavior (TPB), with two additional factors in the measurement model: perceived authority support and perceived environmental concern, integrated with the technology-organization-environment (TOE) model.

Assessing behavioral planning was crucial as it allowed an understanding of the motivations, needs, and challenges faced by SMEs regarding green innovation practices, such as their motivations and obstacles. Understanding behavioral intention was also an initial step in determining SMEs' decision to engage with green innovation. By understanding this, policymakers could design strategies to align SMEs' motivations with sustainable development goals, including appropriate intervention strategies to change behavior. Additionally, the behavioral planning approach fostered awareness of the importance of green innovation practices and increased participation, for example, through authority support and social norms, ensuring that green innovation practices could be fully controlled by SMEs, thus supporting environmental sustainability. This approach involved psychological, social, and environmental factors influencing individual or group behavior. Assessing internal and external factors helped understand how SMEs interacted with new technologies, organizational structures, and environmental factors and how these factors influenced organizational decisions in implementing green innovation. In this study, SMEs in the tourism sector were the focus.

The contributions of this research include the following:

- *First, an integrated analytical framework is provided:* This research offers an integrated analytical framework that enriches the intention to implement green innovation analysis.
- *Second, an in-depth understanding of driving factors:* It provides an in-depth understanding of the factors driving SMEs in the tourism sector to adopt green innovation, offering insights for policymakers and regulators in addressing environmental issues in the tourism sector.
- *Third, practical relevance and guidance:* It offers practical relevance for SMEs in the tourism sector and provides guidance for designing more effective and sustainable green innovation strategies

This paper is structured as follows:

- *Introduction:* The first section introduces the topic.
- *Literature review:* The next section expounds on the main concepts of green innovation, pro-environmental planned behavior, and the technology-organization-environment model.
- *Hypotheses:* The paper then discusses the list of hypotheses investigated.
- *Methodology:* This section describes the research methodology.
- *Significance and implications:* The paper continues with a discussion of the significance of the research findings, implications, and suggestions.
- *Conclusion:* The paper concludes with a summary of the main conclusions.

LITERATURE REVIEW

GREEN INNOVATION

Green innovation (GI) involves creating new technologies, products, and processes aimed at supporting environmental sustainability (Song & Yu, 2018). GI contributed to the advancement of green technologies and products, which improved energy efficiency and reduced greenhouse gas emissions (Gao et al., 2022). GI provided organizations with opportunities to reduce their negative environmental impacts while gaining a competitive edge (Aboelmaged & Hashem, 2019). By focusing on efficient resource use and minimizing environmental footprints through advanced technologies, GI aimed to enhance resource efficiency and mitigate environmental damage. GI was recognized for advancing new manufacturing processes and products that have a reduced impact on ecosystems and the environment (T. K. C. Nguyen, 2022). Shahbaz et al. (2021) described GI as innovations in hardware or software related to green products or processes, including advancements in energy-saving

technologies, pollution control, waste recycling, green product design, and environmental management. Moreover, GI had notable impacts on various sectors, such as digital inclusive finance for SMEs in Taiwan (Wang et al., 2023) and knowledge management practices driving GI in SMEs in Abu Dhabi (Polas et al., 2023). It was considered a key driver of sustainable socio-economic development. According to Xie et al. (2019), GI can be classified into two categories:

- *Green Product Innovation:* This involves creating or significantly enhancing products or services to minimize their environmental impact.
- *Green Process Innovation:* This focuses on developing new methods of production or delivery that surpass previous ones, including improvements in energy efficiency, pollution control, and waste recycling

PRO-ENVIRONMENTAL PLANNED BEHAVIOR MODEL (PEPB)

The PEPB is a development of the proposed behavior model (Nadlifatin et al., 2015) derived from the foundational framework of the theory of planned behavior (TPB) (Ajzen, 1991). TPB is a theory designed to predict and explain human behavior within specific contexts (Ajzen, 1985). TPB is based on the assumption that humans are rational beings and systematically utilize available information. Individuals consider the potential consequences of their actions before choosing whether to engage in or avoid specific behaviors. The PEPB model comprises six factors: perceived authority support (PAS), perceived environmental concern (PEC), and elements adapted from TPB, namely attitude (ATT), subjective norm (SN), perceived behavioral control (PBC), and behavioral intention (BI). PAS emphasizes the importance of receiving support or approval from authoritative entities to facilitate environmental initiatives (Figure 1). PAS elucidates that environmental support necessitates permission or support from authoritative entities. Conversely, PEC represents an internal factor that motivates an individual or group to be highly aware of environmental issues, reflecting their perception of environmental impacts (Persada et al., 2015). Attitude refers to an individual's positive or negative evaluation of their actions, which is used to assess and guide their behavior. Subjective norms relate to the support provided by others when an individual engages in a particular behavior. PBC pertains to an individual's thoughts when deciding on desired behaviors (Ajzen, 1991). Persada et al.'s (2015) research adopts the aforementioned factors from previous studies (M.-F. Chen & Tung, 2014; Nadlifatin et al., 2015).

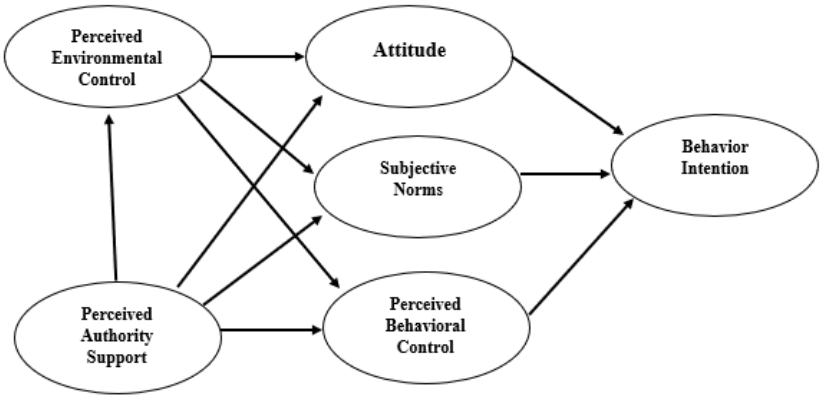

Figure 1. **Pro-environmental planned behavior model**

TECHNOLOGY ORGANIZATION ENVIRONMENT MODEL

The technology organization environment (TOE) model concept refers to the theoretical framework utilized to comprehend the implementation of innovations within organizational contexts. The TOE framework (Figure 2) delineates factors influencing technological innovation or technology adoption into three categories: technological factors, organizational factors, and environmental factors (Drazin, 1991). Compared to other behavioral models, its strength lies in its reflection of the impact of various

aspects (both internal and external) on implementation decisions based on three contextual groups: technology, organization, and environment. The technological context portrays the technologies used and relevant new technologies for each company. The organizational context reflects a company's scope, size, and resource characteristics, while the environmental context describes the arena in which the company conducts business, including industry, competitors, and government (Drazin, 1991). According to J. Zhang et al. (2020) and Dangelico et al. (2017), TOE is elucidated as a model that considers the interaction among technological, organizational, and environmental factors in the context of technology implementation within organizations, where technological factors involve technological characteristics, organizational factors involve organizational structure, organizational culture, and organizational capabilities, and environmental factors involve regulation and environmental complexity.

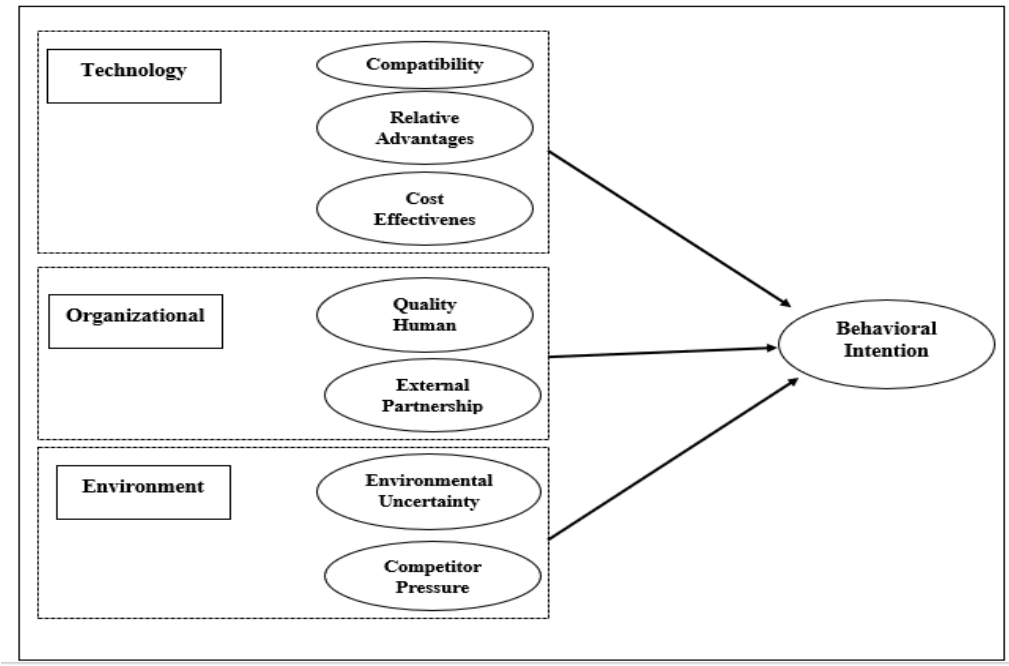

Figure 2. Technology organization environment model

HYPOTHESES DEVELOPMENT AND RESEARCH MODEL

HYPOTHESES DEVELOPMENT

Based on the previous explanations and identified research gaps, this study aimed to examine eleven factors derived from the PEPB and TOE theories. The goal was to analyze the true willingness of SMEs in the tourism sector to adopt green innovations. Using these factors as benchmarks, the researchers developed fifteen hypotheses, detailed in the following sections.

Perceived authority support

Perceived authority support (PAS) refers to individuals' or groups' perception of government backing as the highest decision-maker. It is a relevant factor in influencing technical innovation through regulations, procedures, and policies that encourage citizens to reduce the environmental impact of business activities (German et al., 2022; Nadlifatin et al., 2016).

S. C. Lin et al. (2017) found that environmental monitoring policies and regulations could foster the behavioral intention of business actors to implement green innovation initiatives. Environmental regulatory pressure, which requires business operations to consider environmental aspects, has become the most significant external driver of pro-environmental business attitudes among hotels in China

(Peng et al., 2021). Resource support and facilities such as tax incentives from the government led to the perception or assumption among the grape industry in Canada that this support was related to the general public's expectation for companies to invest in non-polluting industries (Y. Zhang et al., 2020). Other forms of support, such as special appreciation from the government, fostered the perception that society has control over the use of ecolabel products (Mufidah et al., 2018; Nadlifatin et al., 2016). This study evaluated the attitudes (ATT) of SMEs in the tourism sector, subjective norms (SN), and perceived behavioral control (PBC) through perceived authority support in response to the implementation of green innovation.

H1: PAS has a positive relationship with ATT.
H2: PAS has a positive relationship with SN.
H3: PAS has a positive relationship with PBC.

Perceived environmental concern

Perceived environmental concern (PEC) refers to an individual's feelings about any physical activity that encourages the perception of individuals to behave responsibly about environmental conditions (Nadlifatin et al., 2016; Persada et al., 2015). Studies show that most SMEs and entrepreneurs are willing to pay for energy and features less contrary to sustainability (T. K. C. Nguyen, 2022; Xie et al., 2019), although not all do so. Other evidence suggests that environmental concern can influence sustainable behavior either through attitude (ATT), subjective norm (SN), or perceived behavioral control (PBC) (Cai & Li, 2018; Nadlifatin et al., 2016; Persada et al., 2015). Entrepreneurs who care about the environment can also influence the behavior of others by acting as important people who accept or reject green innovation. Entrepreneurs are increasingly concerned about the environment now that they realize the positive benefits of green innovation for the corporate environment (Nadlifatin et al., 2016). The same is considered in this study: the higher the level of concern of SMEs, the more it will encourage them to do green innovation.

H4: PEC has a positive relationship with ATT.
H5: PEC has a positive relationship with SN.
H6: PEC has a positive relationship with PBC.

Attitude

Attitude (ATT) is an individual's evaluation of something given to them as a form of positive or negative response due to learned factors (Aslam et al., 2017; M.-F. Chen & Tung, 2014; Paramita et al., 2018). Paramita et al. (2018) found that the intention to engage in environmentally friendly business is influenced by attitude. Regarding research in the context of environmentally friendly hotels, numerous studies have established that intention is positively influenced by attitude (M.-F. Chen & Tung, 2014; Han & Yoon, 2015). Lee et al. (2023) conducted a study on consumers' intention to use electric vehicles and found that attitude significantly influences consumer behavioral intention. Furthermore, (Chibuogwu et al., 2021) investigated challenges to renewable energy growth in Nigeria, specifically analyzing factors influencing the intention to use renewable energy, revealing that attitude positively affects consumer intention. Dilotsotlhe (2021) demonstrates that positive and significant behavioral intentions (BI) are explained by attitude.

H7: ATT has a positive relationship with BI.

Subjective norm

Subjective norm (SN) is an individual's perception of the expectations from significant others in their lives regarding the performance or non-performance of specific behaviors (Paramita et al., 2018). Research indicates that subjective norms are a crucial variable that influences green purchasing behavior (Yeo & Fisher, 2017). When consumers perceive that people in their group tend to buy green products, they also subconsciously become interested in green products and subsequently generate an intention to purchase with cues from collective behavior. Subjective norms have also been found to be

significant in decisions regarding the adoption of electric vehicles in China (Lee et al., 2023) and alternative fuel vehicles in India (Shanmugavel & Balakrishnan, 2023). Chu et al. (2019) compared electric vehicle users in China and Korea; others' reputation and interest had a negative impact on user satisfaction in Korea, whereas, for electric vehicle users in China, others' reputation and interest served as strong motivators for purchase. In this study, an evaluation of SMEs will be conducted to understand their response to the implementation of green innovation as a result of other SMEs having already implemented green innovation.

H8: SN has a positive relationship with BI.

Perceived behavioral control

Perceived behavioral control (PBC) reflects an individual's confidence in their ability to perform a task based on their assessment of how easy or difficult the task is (Fang & Zhang, 2021). Kijkasiwat (2021) demonstrated that PBC has a significant positive effect on an individual's intention to engage in waste management programs. Additionally, PBC positively influences various environmental behaviors, such as waste reduction (Galván-Mendoza et al., 2022), green shopping (Nadlifatin et al., 2016), and recycling behavior (M.-W. Chen et al., 2022). In this study, it will be examined whether a higher level of perceived behavioral control regarding the implementation of green innovation correlates with a stronger intention to adopt such practices.

H9: PBC has a positive relationship with BI.

Technology

Characteristics of technological innovations, such as compatibility (COM) and relative advantages (RA), can affect the tendency of their application because characteristics are considered cognitive beliefs that are reflected in attitudes toward innovation (Drazin, 1991). Research has significantly demonstrated that the greater the compatibility of an innovation, the more effective it is (Gumilang & Hidayatullah, 2018; Kanchanatanee et al., 2014) significantly proves that the higher the compatibility of an innovation, the higher its effectiveness. RAs are used to evaluate how much better an innovation is compared to the idea it replaces (Shahzad et al., 2022). Companies are inclined to adopt technologies that offer superior performance and higher economic benefits than existing technologies (C.-Y. Lin et al., 2019; J. Zhang et al., 2020). The more suitable the existing innovations are to the needs of SMEs in the tourism area, and the greater the net benefits felt by green innovation, the greater the motivation for SMEs to practice green innovation.

H10: COM has a positive relationship with BI.
H11: RA has a positive relationship with BI.

Organization

The concept of quality of human resources serves as a measure of employees' ability to adapt to changes, integrate new knowledge, and participate in green innovation (C.-Y. Lin et al., 2019). High-quality human resources (QHR) enable organizational success in implementing sustainable strategies and help assess the organization's condition as a valuable asset, thereby serving as a catalyst for fostering innovation intentions. Moreover, external partnerships (EP) can facilitate organizations' access to technology, human resources, financial resources, and collaborative relationships with suppliers, consumers, and other business entities necessary for driving green innovation (Ji et al., 2023). Research demonstrates that collaboration with research-focused universities in environmental studies has aided businesses in formulating sustainable business ideas (Fang & Zhang, 2021), while partnerships with suppliers support the acceleration of sustainable efforts (Peng et al., 2021). In this study, EPs are expected to stimulate the intentions of SMEs in the tourism sector to engage in green innovation.

H12: QHR has a positive relationship with BI.
H13: EP has a positive relationship with BI.

Environment

This dimension encompasses external factors of the organization, such as environmental uncertainty (EU) and competitive pressure (CP). These environmental factors influence the context in which organizations operate and can affect the implementation of innovation. Environmental uncertainty, including changes in strict regulations and changes in consumer preferences for consumption, has encouraged SMEs to be proactive in conducting green innovation (Cai & Li, 2018). Competitive pressure (CP) serves as an incentive provided by competitors to organizations for the adoption of green innovation practices, as competitors who have implemented such practices serve as examples or triggers for other organizations (Cai & Li, 2018).

This pressure stems from competitors who have implemented better environmental practices or achieved competitive advantages through green innovation. Lu (2019) found that competitive pressure acts as a driver of eco-innovation in developing countries in the hotel sector in China. Institutional elements such as competitive pressure play a significant role in shaping eco-innovation strategies in the context of the European Commission (Cai & Li, 2018). It is important to evaluate the influence of competitive pressure on SMEs' intentions to engage in green innovation in the tourism sector.

H14: EU has a positive relationship with BI.
H15: CP has a positive relationship with BI.

RESEARCH METHODOLOGY

RESEARCH DESIGN

The research employed a mixed-methods design to investigate the factors influencing green innovation in SMEs in the tourism sector. A quantitative survey served as the primary instrument, consisting of 45 questions designed to measure variables that could not be directly observed, such as perceptions and attitudes toward green innovation. The survey began with a pilot test involving 30 respondents to ensure the validity and reliability of the research instrument. Additionally, in-depth interviews were conducted with 13 randomly selected respondents to obtain more detailed and contextual explanations supporting the survey responses. This approach allowed the researchers to gain a broad and deep understanding of the factors influencing the adoption of green innovation in SMEs, providing rich data for analysis and offering valuable insights for policymakers and practitioners in the tourism sector.

The data analysis involved descriptive analysis to determine the characteristics of the respondents. Subsequently, an evaluation of the measurement model (outer model) was performed to assess the validity and reliability levels of each indicator. The validity assessment included both convergent validity and discriminant validity, with defined thresholds for outer loading (>0.70), AVE (>0.70), and Fornell-Larcker (<0.90). Additionally, reliability testing was carried out using Cronbach's alpha and composite reliability, each with a threshold set at >0.70. Following this, a structural model evaluation (inner model) was conducted to test hypotheses using indicators such as path coefficients, t-statistics, p-values, and F2. The testing was considered to have positive significance if the values were below the threshold of $p<0.05$, and the F2 value indicated the magnitude of the influence of the path coefficients.

DATA COLLECTION

This study was based on primary data sources collected through a well-structured questionnaire designed with reference to indicators from previous research (e.g., Fang & Zhang, 2021; German et al., 2022; Kousar et al., 2017; S. C. Lin et al., 2017; Lu, 2019; Mufidah et al., 2018; Nadlifatin et al., 2016; Persada et al., 2015; Shahzad et al., 2022; Singh et al., 2022; Thomas et al., 2021; J. Zhang et al., 2020), and then modified and adjusted to be relevant to the target SMEs in Labuan Bajo. The systematic process used to design the questionnaire involved several steps. First, a literature review was

conducted to identify the main constructs and appropriate measurement items. Second, these items were adapted to fit the context of this study. Third, validity and reliability tests were performed with a pilot test involving 30 respondents. The questionnaire employed a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

The questionnaire was then directly distributed to 405 SMEs engaged in green innovation around the Labuan Bajo tourism area, specifically at tourist locations such as Komodo Island, Rinca Island, Puncak Waringin, and Batu Cermin Cave. These locations were selected as they represent major tourist destinations in Labuan Bajo and are included in the super-premium tourism destination development program while also facing significant environmental challenges. The respondents chosen were owners of SMEs in Labuan Bajo, ensuring that the data directly reflected the views and practices of the primary business managers. Non-probability sampling techniques were employed for data collection due to the uncertainty of the SME population structure in Labuan Bajo, allowing researchers to design samples based on the availability and accessibility of respondents meeting inclusion criteria. However, it is acknowledged that the sampled results may be challenging to generalize to a broader population. Data analysis was conducted using SmartPLS 4 software to address the model's complexity with numerous constructs. In addition to the questionnaire, in-depth semi-structured interviews were conducted to gain insights into the activities and programs SMEs implemented for green innovation. These interviews aimed to supplement the questionnaire findings by exploring practical steps and motivations behind green innovation adoption. The semi-structured design featured core questions based on the questionnaire and literature review, with flexibility for probing deeper into specific areas. Each interview lasted 45 to 60 minutes, with respondents informed about the study's objectives and assured confidentiality. Interview data were transcribed and analyzed qualitatively to enrich the quantitative results from the questionnaires.

DATA ANALYSIS AND RESULTS

RESPONDENTS DEMOGRAPHIC CHARACTERISTICS

The respondents comprised 405 small and medium business owners, with 38% from the creative industry sector (n = 155), 33% from the culinary sector (n = 134), and 29% from the accommodation sector (n = 116) (Table 1). Of these SMEs, 64% had been operating for 5-10 years, while 36% had been in operation for three years, indicating that their business processes had entered the growth phase. Therefore, SMEs should pay more attention to green innovation in their production processes. Regarding the number of employees, the majority of SMEs had 2-10 employees.

Table 1. Respondents' demographic characteristics

Type of enterprise		Enterprise location		Enterprise duration		No. employees	
Creative industry	38%	Komodo Island	29%	< 1 Year	9%	2	28%
Culinary	33%	Rinca Island	25%	1-2 Years	17%	3	55%
Accommodation	29%	Puncak Waringin	23%	3-4 Years	22%	5	12%
		Batu Cermin Cave	23%	5 Years	42%	10	5%
				>5 Years	10%		

MEASUREMENT MODEL EVALUATION

Table 2 displays the extracted average variance extracted (AVE), outer loading, and Fornell-Larcker for assessing data precision. Each construct is deemed valid if it meets the sequential threshold criteria of >0.5, >0.70, <0.90 (Fornell & Larcker, 1981; Hair et al., 2019). Additionally, the table presents Cronbach's alpha values and composite reliability >0.70, utilized to ascertain the internal consistency of each construct (Henseler et al., 2015). Following the confirmation of validity results, the structural

model is evaluated. In this study, the R2 value for green innovation (GI) is 0.76 (Table 3). Therefore, this model effectively explains a significant portion of the variation in GI, amounting to 76%.

Table 2. Validity and reliability assessment

Variable	Items	Outer loading	AVE	Fornell Larcker	CA	CR
Perceived Authority Support (PAS)	PAS 1	0.71	0.631	0.794	0.855	0.88
	PAS 2	0.769				
	PAS 3	0.837				
	PAS 4	0.82				
	PAS 5	0.827				
Perceived Environmental Concern (PEC)	PEC 1	0.866	0.736	0.858	0.825	0.856
	PEC 2	0.816				
	PEC 3	0.891				
Attitude (ATT)	ATT 1	0.73	0.618	0.786	0.698	0.719
	ATT 2	0.853				
	ATT 3	0.77				
Subjective Norm (SN)	SN 1	0.847	0.703	0.839	0.795	0.839
	SN 2	0.783				
	SN 3	0.883				
Perceived Behavioral Control (PBC)	PBC 1	0.841	0.658	0.811	0.742	0.754
	PBC 2	0.814				
	PBC 3	0.778				
Compatibility (COM)	COM 1	0.843	0.785	0.886	0.865	0.901
	COM 2	0.889				
	COM 3	0.925				
Relative Advantages (RA)	RA 1	0.834	0.78	0.877	0.727	0.809
	RA 2	0.929				
Quality of Human Resource (QHR)	QHR 1	0.811	0.659	0.883	0.766	0.908
	QHR 2	0.737				
	QHR 3	0.88				
External Partnership (EP)	EP 1	0.721	0.621	0.812	0.88	0.909
	EP 2	0.826				
	EP 3	0.803				
	EP 4	0.831				
	EP 5	0.75				
Environmental Uncertainty (EU)	EU 1	0.92	0.791	0.890	0.912	0.937
	EU 2	0.796				
	EU 3	0.947				
	EU 4	0.889				
Competitor Pressure (CP)	CP 1	0.9	0.75	0.866	0.888	0.893
	CP 2	0.882				
	CP 3	0.877				
Behavioral Intention (BI)	BI 1	0.878	0.742	0.862	0.827	0.84
	BI 2	0.889				
	BI 3	0.816				

Table 3 indicates an R-square value of 0.76 for green innovation, suggesting that the research model effectively explains 76% of the variation in green innovation.

Table 3. R-square (R^2) value of construct

Variable	R-Square
Attitude	0.425
Subjective Norm	0.418
Perceived Behavioral Control	0.214
Behavioral Intention	0.76

To assess whether the model is sufficient to predict the indices of each latent construct, the cross-validated redundancy test (Q^2) is utilized (Geisser, 1974). According to W. W. Chin (2010), the predictive relevance of the model can be assessed based on whether the Q^2 value is greater than 0. The current Q^2 score of 0.214 indicates that the model has a high level of predictive significance. Table 4 displays a Q^2 value of 0.71, signifying that the model exhibits a high level of predictive significance.

Table 4. Cross-validated redundancy (Q^2) of construct

Variable	Q^2
Attitude	0.414
Subjective Norm	0.403
Perceived Behavioral Control	0.201
Behavioral Intention	0.71

STRUCTURAL MODEL EVALUATION

In this study, SEM was used to test the theoretical correlations. Figure 3 and Table 5 show the structural parameters of the hypothesized relationships. First, it should be noted that from the pro-environmental planned behavior model, almost all variables have a significant effect on the intention of SMEs in Labuan Bajo to do green innovation. It is known that perceived authority support affects attitude (β=0.355), subjective norm (β=0.261), and perceived behavioral control (β=0.363), and the variable perceived environmental concern also has a significant positive effect on attitude (β=0.147), subjective norm (β=0.238), but not significant on perceived behavioral control (β=0.122) so that the hypothesis is rejected. Furthermore, behavioral intention is positively and significantly influenced by attitude (β=0.138), subjective norm (β=0.152), and not significantly by perceived behavioral control (β=0.064). The technological, organizational environmental model supports all hypotheses where compatibility (β=0.237), relative advantages (β=0.289), quality of human resources (β=0.178), external partnership (β=0.280), environmental uncertainty (β=0.362), and competitor pressure (β=0.218) affect the intention of SMEs in the Labuan Bajo tourism area to do green innovation.

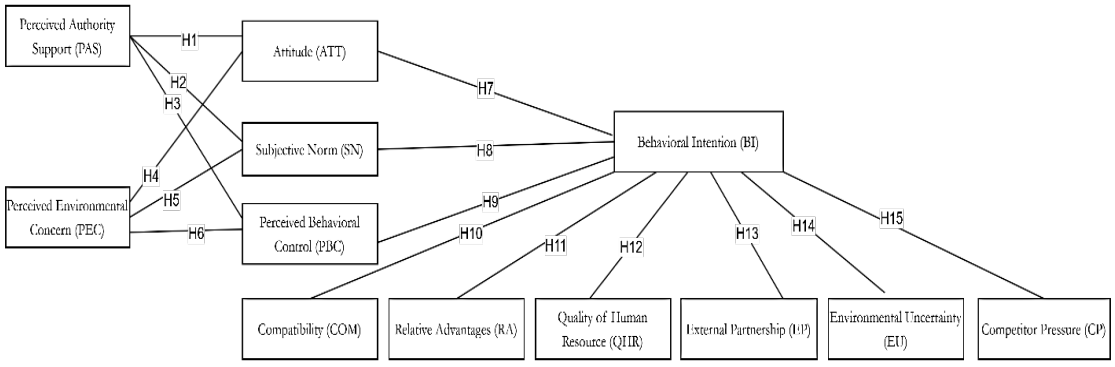

Figure 3. Proposed model created for empirical testing

Table 5. Hypotheses testing

Hypotheses	Variable	Path coefficient	t-statistic	P-value	F^2	Decision
H1	PAS →ATT	0.355	5.892	0.000	0.070	Accepted
H2	PAS → SN	0.261	4.479	0.000	0.038	Accepted
H3	PAS →PBC	0.363	6.966	0.000	0.073	Accepted
H4	PEC → ATT	0.147	2.550	0.011	0.02	Accepted
H5	PEC → SN	0.238	3.236	0.001	0.031	Accepted
H6	PEC → PBC	0.122	1.822	0.068	0.008	Rejected
H7	ATT → BI	0.138	2.601	0.009	0.02	Accepted
H8	SN → BI	0.152	2.053	0.040	0.02	Accepted
H9	PBC → BI	0.064	1.258	0.209	0.004	Rejected
H10	COM → BI	0.237	3.148	0.002	0.04	Accepted
H11	RA → BI	0.289	4.302	0.000	0.049	Accepted
H12	QH → BI	0.178	2.762	0.006	0.03	Accepted
H13	EP → BI	0.280	4.428	0.000	0.078	Accepted
H14	EU → BI	0.362	4.783	0.000	0.07	Accepted
H15	CP → BI	0.218	3.110	0.002	0.03	Accepted

Qualitative Data From Interviews

Interviews with SME operators in the tourism sector in Labuan Bajo revealed several factors motivating their green innovation efforts. One key reason identified by respondents was the support from the government, including policies related to tax incentives, low-interest loans, and green certification awards. These incentives provided strong motivation for adopting more sustainable business practices. For example, one respondent, who owns an eco-friendly accommodation business, received local government support in the form of tax incentives, resulting in operational cost savings. Another respondent received a government award in the form of a certificate, which they believe enhanced their business's reputation. Conversely, another respondent in the creative industry reported receiving government support in the form of easier access to funding and priority for low-interest loans.

Additionally, mass campaigns initiated by the government concerning environmental awareness played a significant role in increasing business operators' awareness of environmental issues. Respondents also noted that collaborations with suppliers who provide environmentally friendly raw materials were crucial in supporting their green innovation efforts. Throughout their business operations, respondents frequently received support and participated in educational and training programs facilitated by NGOs and educational institutions, involving interns or researchers focused on environmental issues.

Equally important, another respondent in the creative weaving industry highlighted the enthusiasm of customers for eco-friendly products and services. Positive feedback from increasingly environmentally conscious customers provided additional incentives for SMEs to continue developing innovations that support environmental sustainability. Customer awareness of sustainability has driven businesses to market their products and services as more environmentally friendly options, thereby enhancing their business image and providing a competitive advantage.

DISCUSSION

The results of integrating PEPB and TOE to assess the intention of SMEs in tourism areas to adopt green innovation revealed a significant positive effect for most constructs, with only two variable relationships not showing significance. A noteworthy finding was the strong positive correlation between perceived authority support and attitude, subjective norm, and perceived behavioral control.

These results aligned with research by Wasiq et al. (2023), which highlights the importance of legal and regulatory support in fostering green innovation. In Labuan Bajo, regulations require SMEs to reduce single-use plastics and manage waste effectively. Supportive measures included the availability of waste treatment facilities and tax incentive programs that improved business operational efficiency. Award programs for creative industry SMEs that produced recycled products enhanced business image, while educational programs and workshops organized by the government encouraged SMEs to adopt green innovation.

Additionally, SMEs' perspectives on local government support, such as low-interest loan facilities at regional development banks for purchasing environmentally friendly business equipment, were significant. The positive impact of government-run routine campaign programs, where tourists as consumers sought environmentally friendly products, also highlighted social expectations and norms for green innovation practices. This reinforced perceived behavioral control, motivating SMEs to engage in green innovation.

The second finding accepted Hypotheses 4 and 5 and supported the research of S. C. Lin et al. (2017), Nadlifatin et al. (2016), Peng et al. (2021), and Persada et al. (2015). It was found that SMEs in the Labuan Bajo tourism area realized the importance of concern for environmental issues, especially the marine environment, which is one of the main potentials of Labuan Bajo tourism. Damage to the marine environment would reduce the beauty of tourist attractions, leading to a loss of tourists and negatively impacting the sustainability of their business. This environmental concern encouraged SMEs to have a positive attitude towards green innovation. SMEs in Labuan Bajo also believed that environmental concerns should be the norm in the tourism industry. They expressed that social norms need to value the use of environmentally friendly local materials in producing weavings as a form of subjective norm shift that is newer and more sustainable.

However, Hypothesis 6, which posited that perceived environmental concerns by SMEs in the Labuan Bajo tourism sector would affect perceived behavioral control, was not supported. Limited knowledge and skills that affected their ability to run an environmentally friendly business were the reasons. Some SMEs admitted that they did not fully understand the benefits of sustainable innovation and how to implement it in their businesses.

The third finding, Hypothesis 7, showed that a positive attitude towards green innovation practices was perceived as fun, a good idea, and a wise thing to do, aligning with research by Chibuogwu et al. (2021), J. Chin et al. (2018), Mufidah et al. (2018), and Sawitri et al. (2015). SMEs who owned guesthouses in the area around Puncak Waringin considered that using solar energy sources for water heating in guest bathrooms was a good idea because it saved energy costs and reduced environmental impact, thus forming a positive behavioral intention towards green innovation.

The fourth finding, Hypothesis 8, showed that SMEs considered that their closest parties, such as customers and business partners, had formed social pressure indirectly through social media or public opinion regarding their expectations for the availability of environmentally friendly products. Another social pressure was from the local community for SMEs to use organic local ingredients to support local farmers and environmental sustainability. This was concluded as a social norm that encouraged SMEs to pursue green innovation and supported previous findings by Ateş (2020), J. Chin et al. (2018), Fang and Zhang (2021), and Mufidah et al. (2018). Hypothesis 9 showed that perceived behavioral control did not affect the intention to change, mainly due to the lack of knowledge and skills among SMEs. For example, culinary business owners who wanted to reduce energy consumption faced difficulties installing energy-saving systems, which also incurred additional costs. This reduced perceived behavioral control despite the intention to change.

The fifth finding showed that all constructs in the TOE model were proven to be factors that influenced the intention of SMEs in the Labuan Bajo tourism area to adopt green innovation. Hypothesis 10 showed that the compatibility variable had a significant positive effect on behavioral intention to

carry out green innovation in SMEs in the tourism sector in Labuan Bajo, in line with previous research by German et al. (2022), Kanchanatanee et al. (2014), T. H. Nguyen et al. (2022), and Y. Zhang et al. (2020). Respondents gave examples of waste processors that were easy to implement and did not require major changes to existing infrastructure, increasing motivation to manage waste from business operations.

Furthermore, the relative advantages variable in Hypothesis 11 showed a positive influence on behavioral intention toward green innovation, supporting previous research. Green innovation practices helped create a positive business image and responded to government campaigns related to environmental issues. This was reflected in the awards received by SMEs as a form of appreciation from the government, which were used as a branding medium to improve business image. In addition, customer awareness of environmental issues was also an advantage, as SMEs had a definite market for their products and services. Eco-friendly products and services were considered to have a stronger appeal to customers who sought sustainable experiences.

Hypothesis 12 showed that the quality of human resources significantly influenced the intention to adopt green innovation through knowledge, skills, motivation, and commitment, supporting research by Jia et al. (2017), Setiyani and Rostiani (2021), and Y. Zhang et al. (2020). Accommodation SMEs utilized solar panels and environmentally friendly designs thanks to employee knowledge. High commitment to the environment also encouraged culinary SME employees to limit the use of disposable tools, indicating that adaptability and skills were a strong foundation for green innovation.

Hypothesis 13 showed a significant positive effect of external partnership variables, where cooperation with universities helped SMEs in the research and development of environmentally friendly products and more efficient waste management. Collaboration with organic food ingredient suppliers encouraged culinary SMEs to offer eco-friendly products. Collaboration with other SMEs helped form a varied market, expanded customer choice of environmentally friendly products, and encouraged SMEs to pursue green innovation. These results aligned with research by Alraja et al. (2022), Lu (2019), and Wasiq et al. (2023). The environmental uncertainty variable in hypothesis 14 showed a significant positive effect on green innovation behavioral intentions, supporting the results of research by Ji et al. (2023), Rustiarini et al. (2022), and Singh et al. (2022). Environmental uncertainty, such as changes in strict regulations and pressure from consumers regarding environmental issues, motivated SMEs to reduce the use of single-use plastics in anticipation of changes in regulations governing the prohibition of plastic use in tourism areas. The inability to predict environmentally friendly customer preferences drove SMEs' intentions toward green innovation. This also reflected the need for innovation to respond to changing market demands and compete in a dynamic market. Hypothesis 15 proved that competitive pressure had a significant positive effect on behavioral intention to adopt green innovation. This supported research by Shamsuzzoha et al. (2023), Shahbaz et al. (2021), and Zailani et al. (2015). SMEs in the tourism sector in Labuan Bajo felt the urge to follow the example of competitors who had implemented green innovation. For example, culinary SMEs observed surrounding restaurants switching to organic and recycled raw materials and receiving customer appreciation, motivating other SMEs to do the same.

IMPLICATIONS

The results of this study have several managerial implications that are relevant for various parties. For SMEs in the tourism sector in Labuan Bajo, it is crucial to focus on customer satisfaction and operational efficiency, and also strengthen external collaborations. Recruitment and training of human resources are also key to success in adopting green innovations. For the government, providing support, incentives, and enforcing strict environmental regulations can encourage sustainable business practices. The government can also play a role in raising public awareness of environmental issues. Educational institutions can contribute through education, training, and collaborative research. Meanwhile, other stakeholders concerned with environmental issues can offer financial support to

SMEs committed to green innovation, considering the initial investment required. All parties need to collaborate to create an ecosystem that supports efforts to maintain environmental sustainability in Labuan Bajo.

LIMITATIONS AND FUTURE RESEARCH

This study has limitations, particularly in its focus on the specific geographical area of Labuan Bajo, which may limit the universal applicability of the findings. To enhance generalizability, future research could expand the scope to include diverse regions and industries. In the measurement model evaluation, the R^2 value of 71% indicates the proportion of variance in the endogenous variables explained by the exogenous variables within the sample data. In contrast, the structural model evaluation, reflected by the Q^2 value of 76%, demonstrates the model's predictive relevance and ability to predict data not included in the model estimation process. The difference between these values underscores the distinction between the model's fit to the existing data and the model's generalizability and predictive power. Future research should aim to identify additional variables and interactions that could account for the unexplained variance, thereby enhancing both R^2 and Q^2 values. For instance, considering variables from leadership and managerial commitment theories, organizational culture, and economic and financial incentives could provide deeper insights

CONCLUSIONS

In this study, the analysis of green innovation in SMEs within the tourism sector, using the PEPB and TOE frameworks, revealed significant findings. The combined explanatory power of PEPB and TOE successfully accounted for 76% of the factors influencing the intention to adopt green innovation in Labuan Bajo. Perceived authority support emerged as the most influential factor, followed by environmental uncertainty, relative advantages, external partnership, perceived environmental concern, compatibility, competitor pressure, quality of human resources, attitude, and subjective norm. However, perceived behavioral control exhibited a relatively weaker impact.

This study contributed to theoretical advancements by formulating a novel theoretical framework that integrated the PEPB and TOE models, providing a more comprehensive understanding of green innovation factors in the context of tourism SMEs. The findings held particular significance for policymakers and practitioners aiming to promote sustainable practices in the tourism sector.

Future research could expand this work to other tourist destinations to provide comparative insights and enhance the generalizability of the results. Such research could explore how varying contextual factors influence green innovation adoption across different settings, thereby aiding the development of more tailored and effective policies and strategies for sustainable tourism development.

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