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THE THEORY OF PLANNED BEHAVIOR IN THE CONTEXT OF CIRCULAR ECONOMY PRACTICES: A PATH TO SUSTAINABLE INDONESIAN ACCOMMODATION INDUSTRY

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Abstract. The world's transformation from linear to circular economies is a major issue today. The demand for goods and services also contributes to environmental damage. Through the Theory of Planned Behavior, this study demonstrates how human behavior influences the adoption of circular economy practices and sustainable business performance. This study examines the role of green intention and green innovation in mediating the relationship, as well as the moderating effect of barriers on this relationship. Data were collected through questionnaires completed by 447 respondents, who were employees in Indonesian accommodation companies. The Structural Equation Model was used to test the model using the Smart PLS 4 tool. The findings show a positive effect of the Theory of Planned Behavior on circular economy practices and sustainable business performance. The role of green intention and green innovation in mediating the relationship in the model also shows positive results. Barriers were found to both strengthen and weaken relationships within the model. The unexpected findings that circular economy practice fails to mediate the relationships in the model and barriers fail to moderate these relationships challenge further explanation. This study also offers theoretical and managerial implications to help accommodation providers address challenges and capitalize on opportunities in their sustainability efforts.

Keywords: circular economy; green innovation; green intention; sustainable business performance; Theory of Planned Behavior

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1. Introduction

Environmental and climate issues are currently a significant concern. Global demand for goods and services has increased the risk of ecosystem degradation, leading the world to shift towards a circular model. The circular economy (CE) minimizes resource consumption, reuses products, and restores natural systems (Martinez-Cabrera and Lopez-del-Pino, 2021). CE can reduce material and energy costs, as well as improve production efficiency; therefore, many companies prioritize it. The accommodation industry, as part of the tourism sector, represents 8% of global greenhouse gas emissions, contributing to climate change (Lenzen et al., 2018). For instance, major hotels on Gili Trawangan, Indonesia, generated 3.27 kg of MSW per bed per day, accounting for 70% of the island's waste (Sekito et al., 2019). The Circular Economy is part of Indonesia's Vision 2045 and the National Medium-Term Development Plan 2020-2024. Indonesia's Circular Economy promotes the reduction, reuse, and recycling of materials to minimize waste. Indonesia aims to achieve a 50% reduction in waste by 2030. Furthermore, between 2010 and 2019, 895 companies received awards for their achievements in the green industry. This supports CE's environmental, business, and social goals.

Although CE adoption is a strategic decision for an organization, it does not occur automatically. The strategic decision needs organizational support and CE adoption by implementers. People at an organization are more willing to adopt CE if they perceive its benefits. A belief that peers, superiors, corporate headquarters, guests, and the community support CE adoption will strengthen subjective norms and increase the implementation of CE. Behavior influences innovation and intention within CE (Alvarez-Risco et al., 2021). The Theory of Planned Behavior (TPB) posits that attitude, subjective norm (SN), and perceived behavioral control (PBC) influence behavioral intention (Kuhl, 1985). An individual's disposition toward behavior is called attitude. Social pressure to act is denoted as subjective norm (SN), and the belief in one's capability to act is termed perceived behavioral control (PBC). The obstacles identified by Mishra et al. (2022) encompass knowledge and skills, technology, culture, finance, strategy, government and regulation, and market factors. Moreover, Guldmann and Huulgaard (2020) demonstrate that companies of the same size and sector may face different barriers, despite having different managerial ambitions regarding CE. Analyzing the challenges faced by firms with diverse operational backgrounds and formulating effective strategies to address them plays a critical role in advancing corporate entrepreneurship toward more sustainable practices through the implementation of Sustainable Business Performance (SBP). SBP aims to achieve a balanced integration of social, environmental, and economic objectives. The Circular Economy (CE) offers considerable potential to simultaneously stimulate economic growth and environmental responsibility, thereby strengthening SBP in a manner that aligns with long-term ecological and market goals. Khan et al. (2022) assert that CE enhances environmental and financial performance. Despite the extensive CE research, there is a dearth of literature on CE in specific sectors, such as the accommodation industry. Boiral et al. (2017) indicate that organizations have not responded isomorphically due to their failure to adopt a cognitive framework, thereby diminishing public and business awareness.

This study investigates the impact of the TPB, green intention, and green innovation on CE practices and SBP, with green intention and green innovation serving as mediating factors. This study also examines the moderating effects of Barriers on model interactions, identifies characteristics, and suggests solutions associated with the implementation of CE strategies. This study complements the lack of CE explanation in the accommodation literature, addresses previous research gaps, and elucidates inconsistencies in correlations. This study contributes to the body of knowledge by identifying key challenges in the adoption of CE practices and proposing strategic interventions to address them. By elucidating the underlying determinants that influence CE adoption, this study provides valuable insights that can guide companies in developing more targeted and effective promotional strategies. Additionally, it underscores the significance of green intention and green innovation in the adoption of CE practices, illustrating the relationship between CE practices and SBP and highlighting its relevance for sustainability. This study suggests that accommodation firms may consider the CE concept to attract investors and mitigate environmental damage associated with consumption.

2. Theoretical Background

2.1. The Theory of Planned Behavior

The Theory of Planned Behavior (TPB) elucidates the relationship between attitude, subjective norms (SN), and perceived behavioral control (PBC) in generating interest in an activity (Kuhl, 1985). This concept is significant in the CE as consumer and organizational behavior play a vital role in sustainable practices. Nasir and Yusof (2024) observed that positive sustainability attitudes can motivate enterprises and individuals to engage in sustainable practices. Hao et al. (2020) found that social expectations to participate in CE practices enhance the willingness to engage in such activities, as per subjective norms. Social influence helps entrepreneurs adopt sustainable practices, thereby improving corporate sustainability. Therefore, based on those theories, this study proposes:

H1. Employees' TPB-based behavior has a positive influence on Circular Economy practices in the accommodation industry.

H3 Employees' TPB-based behavior has a positive influence on Sustainable Business Performance in the accommodation industry.

Note. In this study, the term “Employees’ TPB-based behavior” is used consistently across the hypotheses to refer to employee behavior explained through the Theory of Planned Behavior (TPB) framework.

2.2. Circular Economy Practices

CE practices, through resource efficiency, align with SBP's objective of minimizing waste and enhancing resource utilization. Ting et al. (2023) argue that CE business models enhance operational management, leading to more environmentally sustainable and resource-efficient production. Moreover, previous studies indicate that CE practices can serve as a mediator. Organizations that exhibit favorable attitudes toward corporate entrepreneurship are more likely to adopt sustainable practices that enhance performance. Furthermore, Obeidat et al. (2022) reveal the importance of green intention in CE activities for sustainability. Additionally, research indicates that CE practices mediate the relationship between Innovation and SBP. According to Suchek et al. (2021), organizations pursuing circularity must innovate their business strategies and engage with stakeholders to achieve economic, social, and environmental objectives. Using this theoretical foundation, this study proposes:

H2. Circular Economy practices have a positive influence on Sustainable Business Performance in the accommodation industry.

H8a. Employees' TPB-based behavior influences Sustainable Business Performance through Circular Economy practices in the accommodation industry.

H8b. Green Intention influences Sustainable Business Performance through Circular Economy practices in the accommodation industry.

H8c. Green Innovation influences Sustainable Business Performance through Circular Economy practices in the accommodation industry.

2.3. Green Intention

Green intention, influenced by personal values, social norms, and education, impacts a company's ability to achieve sustainable performance outcomes. Kim et al. (2022) observed that threats such as COVID-19 have increased customers' propensity to engage with sustainable companies through sustainable behaviors. This can encourage businesses to adopt more sustainable operations and strategies. Furthermore, researchers found that green intention is a mediator in effectively translating the TPB concept into the adoption of CE practices. Alvarez-Risco et al. (2021) found that attitude significantly influences behavioral intention related to the adoption of CE practices, underlining the role of intention as a mediating factor. Understanding consumer behavior in the context of CE enhances sustainable consumption. This study proposes, based on the above theories:

H4. Green Intention has a positive influence on Sustainable Business Performance in the accommodation industry.

H6. Employees' TPB-based behavior influences Circular Economy practices through Green Intention in the accommodation industry.

2.4. Green Innovation

Product, process, and business model innovation can affect corporate sustainability. Green innovation primarily improves SBP through increased operational efficiency. Efficiency reduces costs and minimizes waste, thereby improving environmental conditions. Yang and Jang (2020) asserted that business model innovation that adheres to sustainability standards can enhance financial performance. Furthermore, green innovation can act as a mediator. Stubbs (2019) demonstrated that green innovation mediates the relationship between attitude and CE practices, and that business model innovation is essential for sustainability. This study presents the following hypotheses based on the theory outlined.

H5. Green Innovation has a positive influence on Sustainable Business Performance in the accommodation industry.

H7. Employees' TPB-based behavior influences Circular Economy practices through Green Innovation in the accommodation industry.

2.5. Barriers

Organizations encounter numerous challenges in implementing a CE. The significant initial investment required to transition from linear to circular business models represents a major obstacle to adopting CE practices. In developing countries like Malaysia, businesses face constraints related to limited capital and high initial costs (Ting et al., 2023). Insufficient supportive policies and legislation may also hinder the transformation of CE.

Garcés-Ayerbe et al. (2019) emphasized the significance of institutional support for CE initiatives. Moreover, consumer behavior plays a vital role in CE projects. Camacho-Otero et al. (2018) identified that consumer ignorance regarding circular solutions impedes their adoption. Furthermore, CE transitions frequently require advanced technology and methodologies. Numerous organizations lack the requisite technology and expertise. Kirchherr et al. (2018) highlighted that postponing technological advancements may obstruct circular practices, particularly within established industries. Supply chain complexity may complicate the installation of CE practices. Batista et al. (2018) emphasize the significance of stakeholder involvement in establishing a circular supply chain. This study examines the TPB, green intention, green innovation, and barriers related to CE practices. Barriers may influence the relationship between green intention and the TPB. Rojas-Córdova et al. (2020) assert that perceived obstacles influence a company's intentions for innovation. This asserts that companies must address these challenges to foster innovation and circularity. This study presents the following hypotheses derived from the aforementioned theories:

H9a. Barriers moderate the relationship between Employees' TPB-based behavior and Green Intention in the accommodation industry.

H9b. Barriers moderate the relationship between Employees' TPB-based behavior and Green Innovation in the accommodation industry.

H9c. Barriers moderate the relationship between Green Innovation and Circular Economy practices in the accommodation industry.

H9d. Barriers moderate the relationship between Green Intention and Circular Economy practices in the accommodation industry.

Based on the theoretical background above, Figure 1 below presents the conceptual research framework that will be examined in this study.

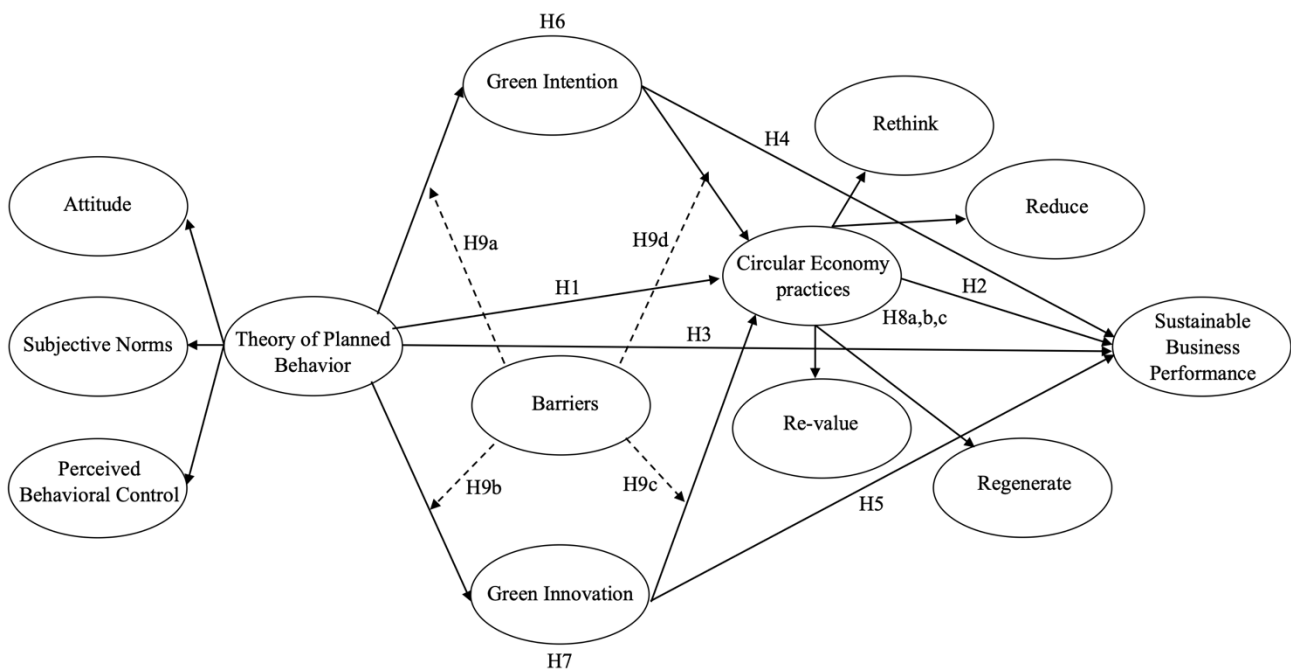


Figure 1. Conceptual Research Framework

Source: the authors

3. Methodology

3.1. Sampling and Data Collection

This research employs a quantitative design to examine the relationship, utilizing a sample of employees from organizations that have implemented CE practices. A series of structural equation models (SEM) will be employed to examine the relationships among variables, focusing on the mediating role of green intention and green innovation, as well as the moderating effect of barriers. A pilot questionnaire was administered to 30 respondents to ensure clarity, and feedback was used to refine it. The finalized 58-question survey was distributed to 550 respondents in the Indonesian accommodation industry between March 3 and July 21, 2023. With two research assistants overseeing the process, 493 responses were collected, of which 46 were deemed inadequate. The final sample of 447 respondents, representing an effective response rate of 81.27%, was used for analysis. Collecting data from more than 400 participants can provide the statistical power needed to comprehensively explore mediation and moderation effects (Wang et al., 2022). The sample for this study consisted of 447 datasets, allowing for further processing. The demographic information of the respondents is presented in Table 1 below.

Table 1. Respondents' demographic data

<i>Characteristics</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>	<i>Accumulate (%)</i>
Gender			
Male	284	63.53	63.53
Female	163	36.47	100.00
Age			
Under 20 years old	48	10.74	10.74
21-30 years old	278	62.19	72.93
31-40 years old	80	17.90	90.83
41-50 years old	32	7.16	97.99
Above 50 years old	9	2.01	100.00
Education level			
Senior high school	291	65.10	65.10
Diploma	70	15.66	80.76
Bachelor	85	19.02	99.78
Magister	1	0.22	100.00
Work experience			
Under 2 years	225	50.34	50.34
2-5 years	129	28.86	79.20
5-10 years	56	12.53	91.73
10-15 years	21	4.70	96.43
15-20 years	7	1.57	98
Over 20 years	9	2.00	100.00
Job level			
Grassroots employee	376	84.12	84.12
Supervisor	41	9.17	93.29
Manager	24	5.37	98.66
Director/GM	6	1.34	100.00
Department			
Front Office	153	34.23	34.23
Housekeeping	74	16.55	50.78
Food and Beverage Service	58	12.98	63.76
Food Product	36	8.05	71.81
HRD	46	10.29	82.10
Sales Marketing	21	4.70	86.80
Finance	19	4.25	91.05
Information Technology	2	0.45	91.50
Engineering	8	1.79	93.29
Recreational and Entertainment	24	5.37	98.66
General Affairs	6	1.34	100.00
Hotel Rating Star			
1-star hotel	59	13.20	13.20
2-star hotel	113	25.28	38.48
3-star hotel	145	32.44	70.92
4-star hotel	91	20.36	91.28

5-star hotel	39	8.72	100.00
Resident			
Northern Indonesia	84	18.79	18.79
Eastern Indonesia	49	10.96	29.75
Southern Indonesia	272	60.85	90.6
Western Indonesia	42	9.40	100.00

Source: the authors' data processing results

3.2. Measurement Variables

This research examines seven constructs: Theory of Planned Behavior, Green Intention, Green Innovation, CE Practices, Sustainable Business Performance, and Barriers. The TPB construct variable comprises three dimensions: Attitude, Subjective Norms (SN), and Perceived Behavioral Control (PBC) (Kuhl, 1985). The Attitude dimension, comprising five measurement items, was derived from Yeh et al. (2021). The SN and PBC dimensions, each comprising five measurement items, were derived from Nimri et al. (2020). The Green Intention construct variable, comprising five measurement items, was sourced from Nimri et al. (2020) and Yeh et al. (2021). The Green Innovation construct variable, comprising six measurement items, was derived from the works of Khan et al. (2022), Ghisellini et al. (2016), and Gusmerotti et al. (2023). The CE practices construct variable comprises four dimensions: Rethink, Reduce, Regenerate, and Revalue. This framework is derived from the works of Khan et al. (2022), Ghisellini et al. (2016), and Gusmerotti et al. (2023). Specifically, it includes five measurement items for Rethink, four for Reduce, five for Regenerate, and seven for Revalue. The five SBP construct variables, comprising five measurement items, were derived from Khan et al. (2022). The Barriers construct variable, consisting of six measurement items, was derived from Khan et al. (2022).

3.3. Data Analysis

A 7-point Likert scale was employed to evaluate the respondents' responses. The study used the PLS-SEM data analysis method (Ringle et al., 2024). This study employs a hierarchical component model approach, incorporating both higher-order constructs (latent variables) and lower-order constructs (dimensions) (Sarstedt et al., 2019). The outer model was evaluated using a distinct two-stage method. Figure 2 presents the findings of this analysis.

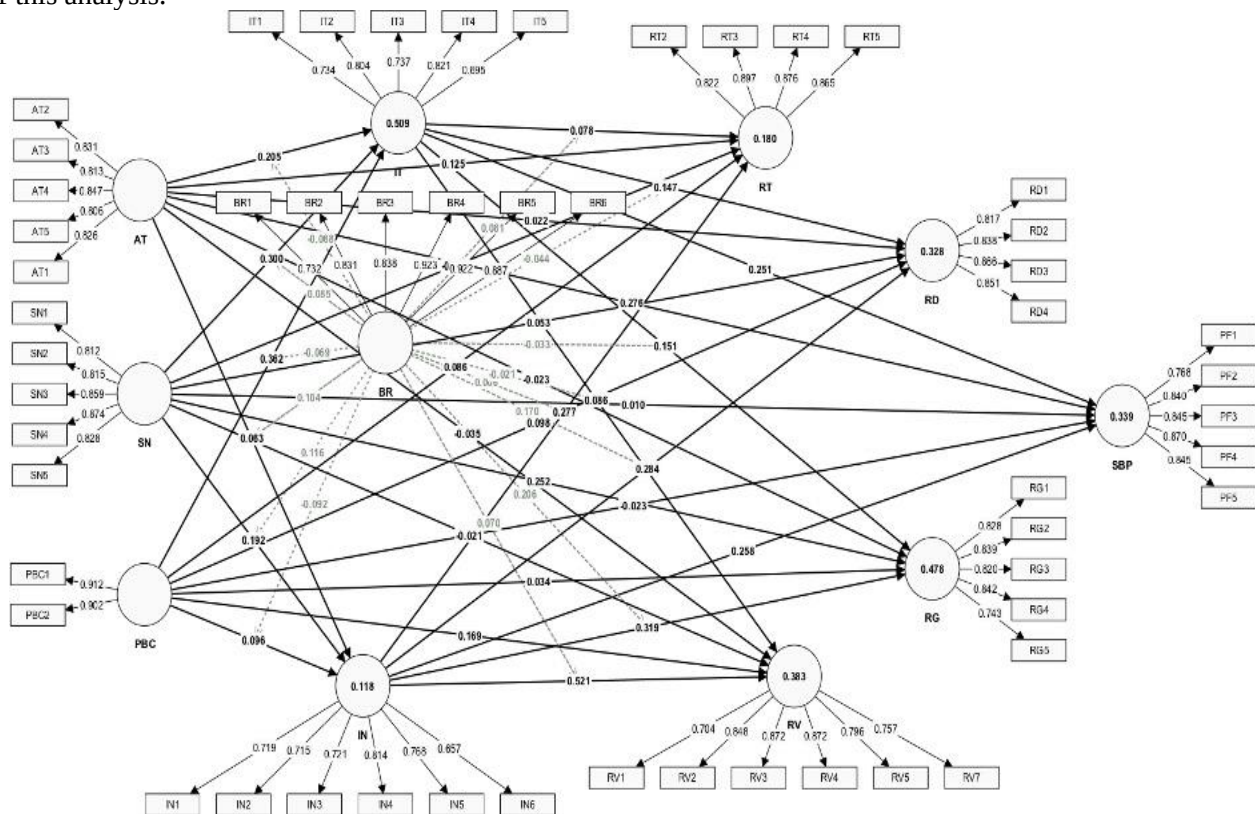


Figure 2. First-stage outer model data processing

Source: the authors

Findings indicate that PBC3, PBC4, PBC5, RT1, and RV6 failed to meet the factor loading criterion of 0.708. Consequently, these indicators were removed from the model. Items with low loadings may weaken relationships within the construct, and their removal may improve the construct's overall convergent validity. The remaining indicators met the criteria for further analysis. The Cronbach's alpha score and composite reliability for all variables exceed 0.7, signifying reliable and consistent measurements. The Average Variation Extracted (AVE) value for each construct exceeds 0.5, demonstrating that the construct accounts for more than 50% of the variation of the indicator, thereby confirming convergent validity. Table 2 presents the construct validity.

Table 2. Analysis of the measurement item's construct validity

<i>Indicator</i>	<i>Measurements Items</i>	<i>FL</i>	<i>Cronbach's Alpha</i>	<i>Composite Reliability</i>	<i>AVE</i>
AT1	Feelings of joy.	0.826	0.883	0.914	0.680
AT2	Feelings of comfort.	0.831			
AT3	Feelings of usefulness.	0.813			
AT4	Feelings of importance.	0.847			
AT5	Feelings of responsibility.	0.806			
SN1	Paying attention to the opinions of others who are respected.	0.812	0.894	0.922	0.702
SN2	Paying attention to the opinions of others who are important.	0.815			
SN3	Taking into account the expectations of others who are important.	0.859			
SN4	Following the actions of important people around.	0.874			
SN5	Following the actions of others who are respected.	0.828			
PBC1	Self-awareness about having self-capability.	0.912	0.784	0.903	0.822
PBC2	Self-confidence to make choices.	0.902			
PBC3	Self-confidence to make decisions.	(*)			
PBC4	Self-doubt in doing the job.	(*)			
PBC5	Self-confidence in doing the job.	(*)			
IT1	Willingness to work in a CE hotel.	0.734	0.816	0.872	0.577
IT2	Willingness to implement CE practices.	0.804			
IT3	Willingness to choose.	0.737			
IT4	Willingness to recommend.	0.821			
IT5	Willingness to provide positive comments.	0.695			
BR1	Lack of financial.	0.732	0.929	0.943	0.736
BR2	Lack of skills.	0.831			
BR3	Lack of knowledge.	0.838			
BR4	Lack of commitment.	0.923			
BR5	Lack of facilities.	0.922			
BR6	Lack of relationships.	0.887			
RT1	Using shared equipment and resources.	(*)	0.889	0.923	0.749
RT2	Think about repairing furniture and reusing it.	0.822			
RT3	Think about repairing electronic products and reusing them.	0.897			
RT4	Think about repairing machines and reusing them.	0.876			
RT5	Think about repairing computers and reusing them.	0.865			
RD1	Saving electricity.	0.817	0.865	0.908	0.711
RD2	Saving water.	0.838			
RD3	Restricting plastic usage.	0.866			
RD4	Reducing food waste.	0.851			
RG1	Branding hotels with environmental sustainability.	0.828	0.873	0.908	0.665
RG2	Providing training on environmental issues to employees.	0.839			
RG3	Providing more funds for environmental sustainability activities.	0.820			
RG4	Simplifying bureaucracy for environmental sustainability activities.	0.842			
RG5	Providing territorial marketing incentives to advance the local economy.	0.743			
RV1	Reuse of waste water.	0.704	0.894	0.920	0.657
RV2	Reuse of furniture waste.	0.848			
RV3	Reuse of paper waste.	0.872			

RV4	Use of refill soap and shampoo.	0.872			
RV5	Utilization of organic waste for animal feed or compost.	0.796			
RV6	Reuse of leftover food for employee consumption or distribution to those in need.	(*)			
RV7	Recycle waste.	0.757			
IN1	Use of recycled materials.	0.719	0.828	0.875	0.539
IN2	Use of renewable energy (solar, wind, etc.).	0.715			
IN3	Use of energy-efficient products.	0.721			
IN4	Use of waste products.	0.814			
IN5	Use of secondary raw materials and by-products.	0.768			
IN6	Weather-adaptive building design.	0.657			
PF1	Reducing environmental impact.	0.768	0.891	0.920	0.697
PF2	Increasing hotel profits.	0.840			
PF3	Increasing service quality.	0.845			
PF4	Increasing hotel reputation.	0.870			
PF5	Increasing satisfaction and commitment.	0.845			

Source: the authors' data processing results

Additionally, the HTMT ratios were employed to assess discriminant validity. The findings confirmed that the HTMT ratio value of each construct is less than 0.85, indicating that each construct is distinct and exhibits minimal overlap with other variables. Table 3 below provides a detailed evaluation of discriminant validity in the initial stage.

Table 3. First stage discriminant validity – HTMT ratios

	AT	BR	IN	IT	PBC	RD	RG	RT	RV	SBP	SN
AT											
BR	0.196										
IN	0.277	0.107									
IT	0.624	0.114	0.303								
PBC	0.558	0.161	0.273	0.745							
RD	0.347	0.258	0.478	0.422	0.393						
RG	0.407	0.262	0.576	0.508	0.416	0.759					
RT	0.295	0.064	0.407	0.292	0.283	0.298	0.357				
RV	0.231	0.068	0.666	0.341	0.365	0.405	0.386	0.319			
SBP	0.526	0.089	0.450	0.537	0.380	0.375	0.449	0.256	0.412		
SN	0.615	0.074	0.307	0.675	0.562	0.317	0.494	0.236	0.265	0.407	

Source: the authors' data processing results

In the second stage of external model evaluation, we utilized the latent variable scores of the lower-order constructs to assess the higher-order constructs, re-applying dimensionality (Sarstedt et al., 2019). Figure 3 presents the results of the external model evaluation for the second stage.

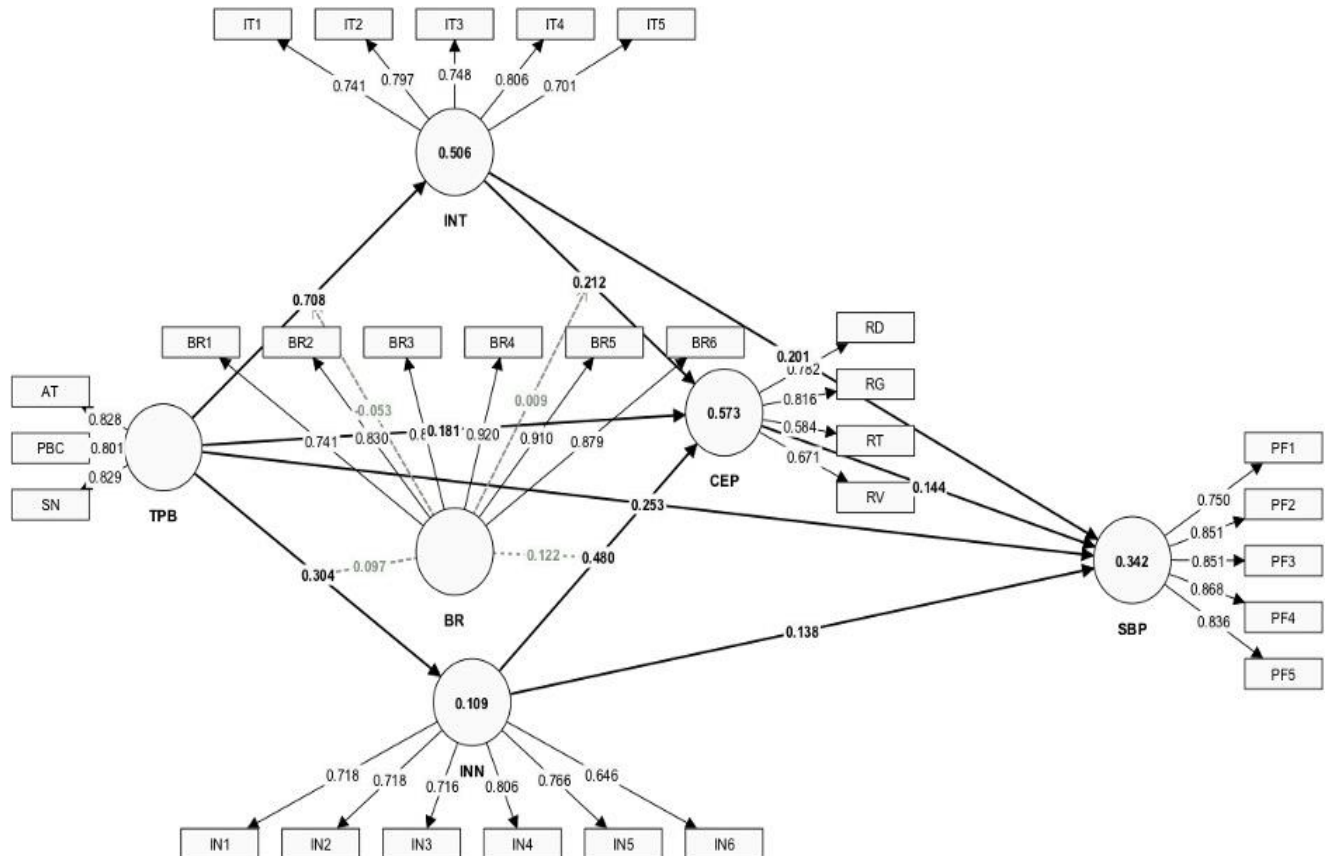


Figure 3. Second-stage outer model data processing

The findings indicate that the CR values for all variables exceed 0.7, meeting the criteria for construct reliability. The AVE value is greater than 0.5, confirming convergent validity. VIF scores below 5 indicate an acceptable level of multicollinearity. Table 4 below provides detailed information for the validity and reliability tests in the second stage.

Table 4. The second stage of factor loading, construct reliability, and convergent validity evaluation

HOC	LOC	FL	VIF	Cronbach's Alpha	Composite Reliability	AVE
TPB	AT	0.828	1.579	0.755	0.860	0.671
	SN	0.829	1.562			
	PBC	0.801	1.442			
CEP	RT	0.584	1.168	0.683	0.808	0.517
	RD	0.782	1.734			
	RG	0.816	1.766			
	RV	0.671	1.179			

Note: TPB=Theory of Planned Behavior; AT=Attitude; SN=Subjective Norms; PBC=Perceived Behavioral Control; CEP= CE Practices; RT=Rethink; RD=Reduce; RG=Regenerate; RV= Revalue; HOC=Higher Order Construct; LOC=Lower Order Construct; FL=Factor Loading; VIF=Variance Inflation Factor; AVE=Average Variance Extracted.

Source: the authors' data processing results

Furthermore, in the second stage, the findings also confirmed that the HTMT ratio value of each construct was less than 0.85, which met the requirements of discriminant validity. The assessment of discriminant validity in the second stage is presented in Table 5.

Table 5. Second stage discriminant validity – HTMT ratios

	BR	CEP	INN	INT	SBP	TPB
BR						
CEP	0.280					
INN	0.116	0.822				
INT	0.127	0.644	0.301			
SBP	0.112	0.580	0.417	0.571		
TPB	0.178	0.710	0.389	0.839	0.623	

Source: the authors' data processing results

4. Results and Discussion

Next, we assessed the inner model. The bootstrapping method assessed the significance level of the coefficients using statistical estimates derived from 5,000 subsamples (Ringle et al., 2024). Table 6 presents the coefficients, t-values, and significance levels (p-values). The results show that Hypotheses 1 to 5 are all supported.

Table 6. Coefficients, t-values, and significance levels.

Hypothesis		Path Coefficient	T-Value	P-Value	Result
H1	TPB → CEP	0.181	3.337	***	Supported
H2	CEP → SBP	0.144	1.791	*	Supported
H3	TPB → SBP	0.253	3.587	***	Supported
H4	INT → SBP	0.201	3.062	***	Supported
H5	INN → SBP	0.138	2.047	*	Supported

Note: ***p<0.001; *p<0.05

Source: the authors' data processing results

Based on the results above, **first**, this study shows that employees' TPB-based behavior positively influences the adoption of CE practices, indicating that CE practices in the workplace are more likely to occur as awareness of sustainable behavior increases. This finding is supported by Mehta and Sharma (2021), who found that attitude increases the likelihood of implementing CE strategies. **Second**, implementing CE practices has a positive impact on SBP. This supports the research of Obeidat et al. (2022), which suggests that CE practices enhance operational efficiency and improve business performance by aligning with sustainable consumer preferences.

Moreover, this study identifies key managerial implications. **First**, the positive relationship between employees' TPB-based behavior and CE practices suggests that accommodation industries should develop a culture that supports sustainable attitudes and subjective norms, prioritizing employee environmental awareness and training. For instance, mandatory scenario-based sustainability training for mid-level managers should highlight the cost-saving benefits of CE. **Second**, the positive impact of CE practices on SBP suggests that implementing CE practices can enhance operational performance, indicating that waste reduction, resource efficiency, and recycling can collectively improve operational efficiency. Practically, this can be further addressed by implementing detailed waste sorting and tracking systems (e.g., using digital records) that mandate the separation of organic waste for on-site composting and partnering with specific local recycling businesses for non-organic materials such as linens and plastics. **Third**, the beneficial effects of employees' TPB-based behavior and SBP support the notion that managerial sustainability preferences have a positive impact on corporate success. Both can improve financial performance and stakeholder satisfaction by aligning their operations with sustainable goals.

Next, we quantified the explanatory power using statistical measures, including the coefficient of determination (R^2), effect size (F^2), and predictive relevance (Q^2), as presented in Table 7 below.

Table 7. Explanatory and predictive power

<i>Independent</i>	<i>Dependent</i>	<i>F-Square</i>	<i>R-Square</i>	<i>Q-Square</i>
TPB	CEP	0.036	0.573	0.215
INT		0.051		
INN		0.472		
TPB	SBP	0.045	0.342	0.534
INT		0.029		
INN		0.017		
CEP		0.015		

Note: TPB=Theory of Planned Behavior; INT=Green Intention; INN=Green Innovation; CEP= CE Practices; SBP=Sustainable Business Performance

Source: the authors' data processing results

The R^2 value of CE practices is 0.573, indicating that TPB, INT, and INN account for 57.3% of the variance in CE practices, with the remaining 42.7% attributable to other variables not included in the model. The R^2 value of SBP is 0.342, indicating that TPB, INT, INN, and CE practices account for 34.2% of the variation in SBP. In comparison, 65.8% is attributed to other variables not considered in the model. Furthermore, the F^2 value reflects the extent of the predictor variable's contribution to the R^2 of the observed variable. The table indicates that the influence of CE practices, as determined by TPB, INT, and INN, yields an F^2 value of 0.036 for TPB, 0.051 for INT, and 0.472 for INN. Removing INN from the model will result in a substantial alteration in CE practices, leading to a significant decrease in the R^2 value of CE practices. In contrast to SBP, the F^2 value for TPB is 0.045, the INT value is 0.029, the INN value is 0.017, and CE practices value is 0.015. Removing any single variable from the model will result in a change in SBP, albeit an insignificant one. Finally, the predictive relevance of the endogenous construct (Q^2) exceeds 0. The results indicate that the Q^2 for CE practices is 0.215, while the Q^2 for SBP is 0.534. Next, this study also examined the mediation effect, as presented in Table 8 below.

Table 8. Mediation analysis result

<i>Hypothesis</i>	<i>Path</i>	<i>Direct Effect</i>		<i>Specific Indirect Effect</i>			<i>Conclusion</i>
		β	<i>t-value</i>	<i>Mediation</i>	β	<i>t-value</i>	
H6	TPB $\rightarrow$ CEP	0.181	3.337***	INT	0.150	3.862***	Partial Mediation
H7	TPB $\rightarrow$ CEP	0.181	3.337***	INN	0.146	5.699***	Partial Mediation
H8a	TPB $\rightarrow$ SBP	0.253	3.587***	CEP	0.026	1.576	No Mediation
H8b	INT $\rightarrow$ SBP	0.201	3.062***	CEP	0.030	1.706*	Partial Mediation
H8c	INN $\rightarrow$ SBP	0.138	2.047*	CEP	0.069	1.710*	Partial Mediation

Note: *** $p < 0.001$; * $p < 0.05$.

Source: the authors' data processing results

Based on the table above, the study's results indicate that all mediation relationships support the hypothesis except Hypothesis 8a. In Hypotheses 6 and 7, the roles of green intention and green innovation as mediators in the relationship between employees' TPB-based behavior and CE practices further underscore the importance of a sustainability culture. This supports the statement of Šimelytė et al. (2023) that green intention as a component related to TPB is essential for implementing sustainable practices. Furthermore, Arsawan et al. (2020) found that green innovation enhances organizational sustainability, particularly when adopting new technologies and practices. Moreover, for managerial suggestions, employees' TPB-based behavior influences CE practices through Green Intentions. Therefore, accommodation companies should foster strong green intentions among employees and management. One recommendation is to establish an internal "Green Champion" network, where successful CE initiators share their results and testimonials, thereby directly fostering positive attitudes and subjective norms among peers. Furthermore, the positive mediation of Green Innovation from employees' TPB-based behavior to CE practices suggests that encouraging green innovation can enhance sustainable behavior through creativity.

The result of Hypothesis 8a indicates that there is no mediation between employees' TPB-based behavior and SBP through CE practices, with the value of $\beta = 0.026$, $p > 0.05$. This unexpected finding may be attributed to the complexity and multifaceted nature of CE practices. While CE practices aim to enhance sustainability, their direct impact on business performance may be limited by factors such as differing stages of adoption among hotels, resource constraints, and institutional context. Research indicates that hotels at various stages of implementing CE practices exhibit varying levels of commitment and engagement with sustainability practices,

which subsequently impact their business performance outcomes (Hernández et al., 2021). This variability may lead to inconsistent relationships with the SBP across sectors, as early-stage organizations may not have fully integrated CE practices into their operational frameworks, resulting in a misalignment with the sustainable practices necessary for effective mediation (Athamneh & Al-Ajlouni, 2024). Moreover, limited financial, human, and technological resources often prevent some hotels from adopting comprehensive CE practices, potentially hindering their performance and contradicting the positive behavioral intentions proposed by the TPB (Athamneh & Al-Ajlouni, 2024). Kurki & Lähdesmäki (2022) state that a culture that fosters sustainability will increase employee engagement and commitment to sustainable outcomes, strengthening behavioral intentions aligned with the TPB framework. Conversely, a gap between management and staff regarding sustainability goals can hinder the effectiveness of CE practices as a mediating factor, suggesting that employee perceptions and cultural acceptance are crucial. Furthermore, these challenges are exacerbated in environments characterized by regulatory and institutional constraints, which can vary significantly across different locations (Jellema et al., 2022). These barriers can suppress the mediating role of CE practices, meaning that even strong intentions (TPB) may not effectively translate into observable practices (CE practices) that lead to long-term SBP. Next, for managerial suggestions, the finding that CE practices do not mediate the relationship between employees' TPB-based behavior and SBP suggests that while the adoption of CE practices is beneficial, it is not the sole determinant of sustainability performance. Managers should also consider operational efficiency, customer engagement, and sustainable performance technologies.

Finally, this study also examines the moderating effect of the Barriers variable on the relationships between employees' TPB-based behavior and Green Intention, employees' TPB-based behavior and Green Innovation, Green Innovation and CE practices, and Green Intention and CE practices, as presented in Table 9 below.

Table 9. Moderation analysis

<i>Hypothesis</i>	<i>Path</i>	<i>β</i>	<i>t-value</i>	<i>p-value</i>	<i>Conclusion</i>
H9a	(TPB $\times$ BR) $\rightarrow$ INT	-0.053	1.730	*	Supported
H9b	(TPB $\times$ BR) $\rightarrow$ INN	0.097	2.001	*	Supported
H9c	(INN $\times$ BR) $\rightarrow$ CEP	0.122	3.868	***	Supported
H9d	(INT $\times$ BR) $\rightarrow$ CEP	0.009	0.201	>0.05	Not supported

Note: ***p<0.001; *p<0.05.

Source: the authors' data processing results

The table above reveals that hypotheses 9a, 9b, and 9c are accepted. An unexpected finding indicates that Barriers strengthen the relationship between Green Intention and CE practices, with a value of $\beta = 0.009$. Still, Barriers are not a moderating variable for that relationship because the $p\text{-value} > 0.05$; therefore, this finding does not support hypothesis H9d. Moreover, the slope analysis is presented to enhance understanding of the nature of the moderation effect (Fig. 4, Fig. 5, Fig. 6, and Fig. 7). Figure 4 illustrates that the line exhibits increased steepness at elevated barrier levels. This suggests that at elevated levels of Barriers, the relationship between employees' TPB-based behavior and Green Intention is further diminished. Next, in Figure 5, the slope increases for elevated barriers. This suggests that the influence enhances the association between employees' TPB-based behavior and Green Innovation at elevated levels of barriers. In Figure 6, the line exhibits an increased steepness at elevated Barrier levels. This suggests that at elevated levels of Barriers, the influence enhances the connection between Green Innovation and CE practices. Conversely, Figure 7 illustrates that the line remains approximately linear for low and high barriers. While barriers may enhance the relationship between Green Intention and CE practices, the figure indicates that barriers do not serve as moderators for this relationship.

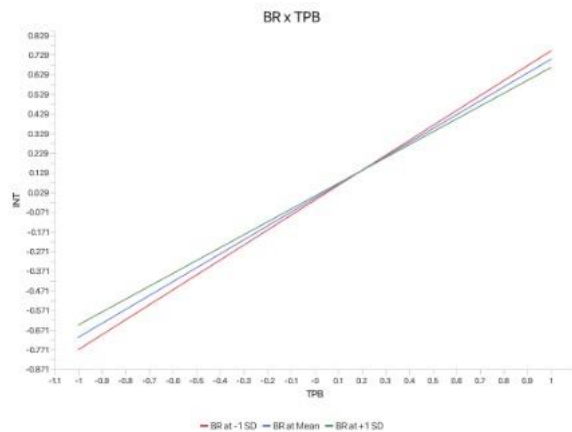


Figure 4. Slope analysis for hypothesis H9a

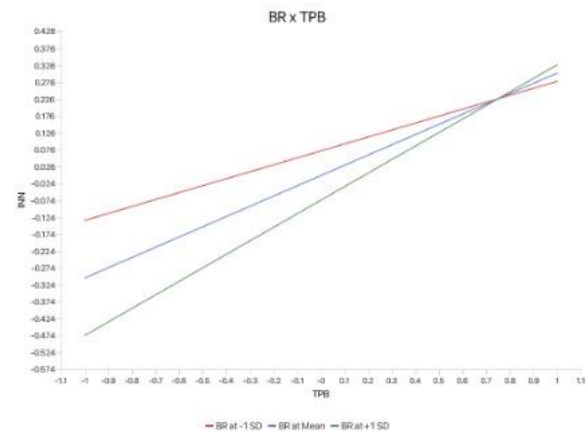


Figure 5. Slope analysis for hypothesis H9b

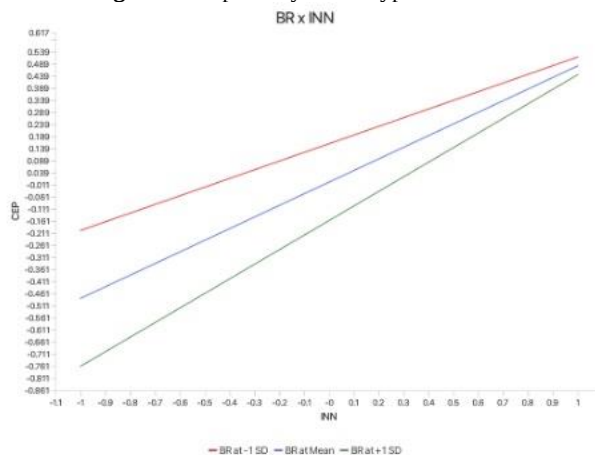


Figure 6. Slope analysis for hypothesis H9c

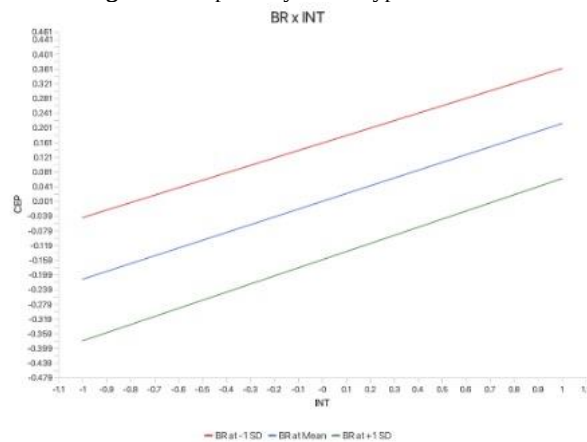


Figure 7. Slope analysis for hypothesis H9d

Based on the results above, **first**, organizational opposition, lack of resources, and inadequate knowledge may hinder the development of positive attitudes and PBC into intentions, thereby reducing the link between employees' TPB-based behavior and green intentions. According to Labella-Fernández et al. (2021), management and operational barriers can hinder the proactive environmental efforts and sustainable practices of TPB. **Second**, the positive moderation of obstacles in employees' TPB-based behavior & Green Innovation connection implies that barriers may initially seem harmful, but they can also spur inventive solutions when businesses attempt to overcome them. Torugsa and O'Donohue (2019) found that proactive problem-solving can enhance creativity and innovation despite barriers. **Third**, the positive moderation of Barriers to Green Innovation and CE practices suggests that overcoming barriers can enhance creative efforts to promote sustainable practices. Alshallaqi et al. (2022) found that agencies that aggressively remove innovation barriers are more likely to succeed with CE practices.

For managerial recommendations, this study **first** suggests that the moderation of negative Barriers to employees' TPB-based behavior and green intentions indicates that limitations, including limited resources, knowledge gaps, and inadequate organizational support, can hinder the intention to engage in sustainable practices. Therefore, managers need to develop targeted training, allocate resources effectively, strengthen leadership support, and establish cross-functional teams to increase employee engagement, creativity, and collaboration in the implementation of CE practices, which in turn will help overcome perceived barriers. **Second**, the moderation of positive Barriers to employees' TPB-based behavior and Green Innovation suggests that, although challenging, obstacles can serve as a catalyst for innovation. In practice, managers can adopt energy-efficient technologies or waste reduction strategies. CE challenges encourage creative problem-solving and sustainable hospitality practices. **Third**, the relationship between Green Innovation and CE practices is positively moderated by Barriers, supporting the premise that barriers can stimulate circular innovation. In

practice, managers are advised to encourage creativity and establish hotel innovation labs or cross-functional teams to implement CE strategies.

Finally, an unexpected finding suggests that barriers enhance the relationship between green intention and CE practices but do not act as moderators. This can be understood through the work of Labella-Fernández et al. (2021), who suggest that individuals or organizations with strong green intentions are more likely to adopt sustainable practices, regardless of existing barriers. This may occur when the relationship between green intention and the implementation of CE practices is strong and direct. Additionally, barriers themselves can serve to motivate organizations to adopt. Nguyễn et al. (2025) stated that in contexts where firms perceive significant barriers, they may feel a greater urgency to adopt sustainable practices to meet compliance standards and excel in sustainability performance. Therefore, even in the presence of barriers such as financial limitations, regulatory challenges, or technological constraints, organizations with a firm commitment to sustainability are more likely to pursue CE practices initiatives. From a managerial perspective, it is recommended that managers and organizations prioritize cultivating strong employee green intentions in CE practices-related activities. At the organizational level, companies can demonstrate their commitment to sustainability by implementing motivational initiatives, such as annual or periodic green awards that recognize the most sustainable departments or individuals. This publicly celebrates success, transforming the desired behavior into an expected organizational norm.

5. Conclusions

This study found a complex relationship between employees' TPB-based behavior, green intention, green innovation, CE practices, and SBP in the accommodation industry. The effects of mediation on the relationship between employees' TPB-based behavior, CE practices, and SBP suggest that green intention and green innovation are critical to these dynamics. Green intention and green innovation promote the adoption of CE in the hotel industry. The unexpected lack of CE practices mediation shows that contextual factors could influence this association. The results underscore the need for a holistic approach that considers both internal organizational dynamics and external environmental factors to sustain the hospitality industry. In addition, various barriers moderate the interaction between employees' TPB-based behavior, green intention, green innovation, and CE practices. While barriers can negatively impact green intentions to engage in sustainable practices, they can also foster green innovation as organizations attempt to overcome these challenges. The unexpected result, where barriers did not moderate the relationship between green intention and CE practices, suggests that strong green intentions can mitigate the impact of barriers. This underscores the importance of fostering a strong commitment to sustainability within organizations, as it can empower them to overcome barriers and successfully implement CE practices. These findings underscore the sustainable journey of the hospitality industry, highlighting the need to identify goals, address barriers, and adopt innovative practices.

This study acknowledges several limitations that need to be considered and can be addressed in future research. **First**, this study examines the role of employees' TPB-based behavior on CE practices and their relationship to SBP within the context of various hotel categories, which may influence the adoption of CE practices and hotel SBP due to varying levels of commitment and engagement with sustainability practices. Further research could segment specific hotel categories to strengthen the findings related to employees' TPB-based behavior. **Second**, this study examines the accommodation industry model. Further research could expand the scope to include additional industry or organizational types, thereby highlighting the complexity of CE practices, enhancing the findings, or generating new concepts. **Third**, this study was conducted in the Indonesian context, which is characterized by a rich cultural and traditional background, as well as unique regulatory factors that may influence the results. For instance, the culture of communal cooperation in Indonesia, which can enhance subjective norms toward sustainability on the one hand, can also conflict with business profit motives. Furthermore, the current state of decentralized and often inconsistent environmental regulations related to waste management and CE initiatives in Indonesia may influence managers' perceived behavioral control, potentially explaining some of the nuances in our employees' TPB-based behavior results. Future research should address these contextual limitations to increase the generalizability of our findings. Conducting additional studies in other countries or engaging in cross-country comparative analysis could further validate

and expand the applicability of the results. **Finally**, this quantitative investigation presents statistical data. Further research could complement this study with a mixed-methods approach to obtain more in-depth results.

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