“How green transformational leadership shapes employee green behavior in Indonesian hotels”

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HOW GREEN TRANSFORMATIONAL LEADERSHIP SHAPES EMPLOYEE GREEN BEHAVIOR IN INDONESIAN HOTELS

Abstract

While green transformational leadership drives environmental sustainability in service organizations, understanding how it shapes employee green behavior in hospitality contexts requires further examination. This study examines how green transformational leadership influences employee green behavior through the mediating role of green psychological climate in Indonesian hotels, and investigates whether these relationships differ between front-of-house and back-of-house employees. Survey data from 412 hotel employees across 36 hotels in the Lake Toba region, North Sumatra, Indonesia, were gathered during the first quarter of 2025. Participating hotels were chosen for their adoption of environmental management systems, with respondents sampled from both guest-facing and operational positions. Structural equation modeling reveals that green transformational leadership exerts a strong influence on green psychological climate ($\beta = 0.583$, $p < 0.001$, $f^2 = 0.514$) and a moderate direct influence on employee green behavior ($\beta = 0.161$, $p < 0.01$, $f^2 = 0.020$). Green psychological climate demonstrates meaningful effects on employee green behavior ($\beta = 0.285$, $p < 0.001$, $f^2 = 0.064$). Mediation analysis confirms partial mediation through green psychological climate ($\beta = 0.166$, $p < 0.001$). Model diagnostics indicate adequate explanatory power ($R^2 = 0.340$), predictive capacity ($Q^2 = 0.223$), and fit (SRMR = 0.042). Aggregation validity is supported by within-unit agreement (rwg(j) = 0.78) and reliability metrics (ICC(1) = 0.60; ICC(2) = 0.90). Functional role comparisons show equivalent relationships across front-of-house and back-of-house contexts ($p > 0.05$). Findings suggest green transformational leadership operates through dual mechanisms, building collective environmental perceptions while enabling individual green actions, with implications for hospitality leadership development.

Keywords transformational, leadership, psychological climate, green, behavior, hotels, Indonesia

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INTRODUCTION

Organizations are compelled to shift from green talk to green walk through employee green behaviors such as energy conservation, waste reduction, and organizational citizenship behavior for the environment (Norton et al., 2015). Employee green behavior (EGB) is positioned as a compound performance domain requiring interventions that target workplace cues, including leadership and climate factors (Zacher et al., 2023). Research shows that psychological and social conditions, such as daily norms and collective expectations, often determine whether green initiatives translate into action (Unsworth et al., 2021).

Green transformational leadership has emerged as a critical driver of employee green behavior. Defined as leadership that integrates environmental vision into organizational goals, models pro-environmen-

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tal behaviors, and empowers employee participation (Robertson, 2018), it explicitly embeds environmental values into inspirational motivation, intellectual stimulation, individualized consideration, and idealized influence. In hospitality contexts where competing operational demands are high, leaders who provide clear environmental cues can enhance organizational citizenship behavior for the environment (Kim et al., 2020).

The psychological mechanism translating leadership into action is green psychological climate, which reflects employee perceptions that organizational policies and practices prioritize the environment and support green behavior (Norton et al., 2017). Studies show that green climate mediates the relationship between leadership and employee green behavior in tourism and hospitality contexts (Bhutto et al., 2021). However, high-level reviews indicate that empirical tests explicitly linking green transformational leadership, psychological climate, and employee behavior in hospitality settings remain limited (Zacher et al., 2023). Additionally, whether these relationships differ between front-of-house and back-of-house employees has not been systematically examined, despite their distinct task environments and exposure to environmental cues.

This study addresses these gaps by testing whether green transformational leadership directly influences employee green behavior in hotels with established environmental management systems, examining whether green psychological climate mediates this relationship, and investigating whether these pathways differ between guest-facing and operational roles.

1. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Employee green behavior refers to actions that reduce an organization's environmental impact, encompassing both in-role and extra-role behaviors such as energy conservation, waste reduction, and organizational citizenship for the environment (Norton et al., 2015). Recent literature positions this behavioral domain as compound in nature, connecting individual factors, team dynamics, managerial practices, and organizational climate (Zacher et al., 2023). Research shows that psychological and social conditions, such as daily norms and collective expectations, often determine whether green initiatives translate into action (Unsworth et al., 2021). In the hospitality industry, customer exposure to environmental programs strengthens pro-environmental cues in service units, making these behaviors strategically important for guest experience and hotel reputation (Zientara & Zamojska, 2018). Quantitative evidence demonstrates positive correlations between these behaviors and pro-environmental attitudes as well as perceptions of green psychological climate (Katz et al., 2022), while longitudinal findings emphasize coworker support and job autonomy as key predictors of behavioral variation over time (Katz et al., 2023). Beyond environmental outcomes, such behaviors relate to work attitude benefits, including enhanced affective commitment (Ren et al., 2023).

Organizational citizenship behavior for the environment (OCBE) represents the discretionary dimension of employee green behavior, comprising eco-initiatives, eco-civic engagement, and eco-helping (Boiral & Paillé, 2012). These behaviors increase when employees perceive organizational support and experience job satisfaction, consistent with social exchange theory (Paillé & Boiral, 2013). In hospitality contexts, environmental leadership promotes OCBE through employee environmental trust and beliefs (Kim et al., 2020). Green inclusive leadership that invites participation and provides psychological safety relates positively to such behaviors (Aboramadan et al., 2022), while also fostering readiness for green innovation in hospitality settings (Zhao et al., 2024). This evidence establishes the behavioral outcomes of interest while pointing toward leadership as a critical antecedent.

Leadership approaches specifically focused on environmental issues have emerged as important drivers of employee green behavior. Green transformational leadership adapts transforma-

tional principles to ecological concerns, where leaders articulate green visions, model environmentally friendly behaviors, and motivate team members toward organizational environmental goals (Robertson, 2018). This leadership construct sharpens the four transformational dimensions of inspirational motivation, intellectual stimulation, individualized consideration, and idealized influence, directing each specifically at environmental goals. Robertson's (2018) formulation demonstrates construct validity and exhibits a nomological network with corporate environmental responsibility, establishing the theoretical foundation for examining leadership effects on environmental behavior.

Empirical evidence reveals that this leadership approach operates at multiple levels. At the team level, it enhances pro-environmental behavior by clarifying ecological goals and fostering harmonious passion toward environmental initiatives, with stronger effects in high power distance cultures where hierarchical cues carry greater weight in shaping behavioral norms (Peng et al., 2021). At the individual level, such leadership triggers affective events that enhance employees' daily green attitudes and behaviors through emotional pathways (Iqbal et al., 2023). Evidence also shows that responsible leadership promotes voluntary workplace green behavior through organizational identification, with green work climate serving as a signal of supportive norms (Zhang et al., 2021). In tourism contexts, green transformational leadership has been shown to foster green creativity through organizational identity mechanisms (Mittal & Dhar, 2016).

Recent hospitality research extends this evidence by revealing varied mechanisms linking green transformational leadership to environmental behavior. Supervisors who articulate environmental visions and demonstrate sustainable practices foster stronger employee engagement with ecological issues, which subsequently drives both creative problem-solving around environmental challenges and discretionary conservation actions (Mistry, 2025). Leadership commitment also translates into formalized human resource practices, including recruitment criteria emphasizing environmental orientation, training addressing conservation competencies, and performance systems rewarding sustainable conduct, all of which shape daily workplace behaviors around energy use and waste reduction (Sachdeva & Singh, 2024). Leadership further serves protective functions by interrupting psychological entitlement that can emerge when employees performing environmental tasks reduce contributions in other domains (Ma et al., 2025). These convergent findings indicate that leadership works simultaneously through individual inspiration and organizational infrastructure, though whether shared climate perceptions mediate these effects across different hotel functions requires empirical examination.

Green psychological climate reflects employees' perceptions that organizational policies, practices, and procedures prioritize the environment (Norton et al., 2017). This construct captures shared perceptions regarding the extent to which organizational systems support environmental action (Dumont et al., 2017). Research demonstrates that such climate perceptions mediate the effect of sustainability policy perceptions on behavior, with different mediation patterns between task-related and proactive environmental actions (Norton et al., 2014). Daily evidence shows that these perceptions bridge the gap between green intentions and actions by increasing the probability of translating intentions into behavior when employees perceive that such behavior is expected and supported (Norton et al., 2017).

Multiple social sources contribute to climate perceptions. Coworker advocacy and supervisor behavior related to green issues strengthen the climate-behavior relationship through normative influences and contextual support (Kim et al., 2017). Perceived organizational support toward the environment correlates positively with OCBE and enhances work attitudes (Lamm et al., 2015). In hotel contexts, a strong green organizational climate synergizes with formal policies to clarify behavioral expectations in service units (Zientara & Zamojska, 2018). Evidence from hospitality and service sectors shows that such climate perceptions mediate the relationship between inclusive green leadership and creative green outcomes through work engagement (Bhutto et al., 2021). In manufacturing contexts, climate perceptions channel organizational policies toward voluntary pro-environmental behavior (Zafar & Suseno,

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2024). Studies examining coworker dynamics further demonstrate that green support from colleagues, combined with a supportive organizational climate, reinforces voluntary behavior (Zafar et al., 2025). This accumulated evidence establishes green psychological climate as a proximal psychological mechanism that potentially mediates leadership effects.

Empirical evidence from hospitality contexts supports the relationship between green transformational leadership and green psychological climate. Generative leadership in hotels, characterized by development focus and future orientation, predicts psychological green climate, which subsequently enhances green commitment and creativity (Afridi et al., 2023). These leadership characteristics overlap conceptually with green transformational dimensions of inspirational motivation and individualized consideration. Most directly, environmentally specific transformational leadership in tourism teams shapes team green psychological climate and priority climate, driving collective green behaviors (Mo et al., 2025). These convergent findings across multiple hospitality samples establish that transformational green leadership behaviors consistently cultivate shared perceptions of environmental priority and support.

Although green HRM practices serve as important levers for environmental behavior through ability, motivation, and opportunity pathways (Dumont et al., 2017; Pham et al., 2020), this study focuses on proximal psychological and social mechanisms to cleanly estimate the causal contribution of leadership and climate independent of formal HR policy architecture. Reviews conclude that proximal contexts such as leaders, peers, and unit climate provide daily cues employees actually perceive during work, giving them substantial leverage in shaping environmental behavior (Zacher et al., 2023). Meta-analytic evidence confirms that environmental behaviors increase when employees perceive support and pro-environmental norms through climate signals (Katz et al., 2022), with job characteristics such as social support enhancing behavioral consistency over time (Katz et al., 2023). Person-environment fit frameworks further demonstrate that congruence between employees' environmental values and job characteristics enhances work attitudes while enabling behavior (Kühner et al., 2024).

Empirical evidence supports green psychological climate as a mediator between leadership and environmental behavior. Ecocentric leadership, which emphasizes environmental values and role modeling, promotes voluntary environmental behavior through psychological green climate as a mediating mechanism (Biswas et al., 2022). These leadership characteristics parallel green transformational dimensions, establishing that climate perceptions transmit leadership signals to individual action. In hospitality contexts, green inclusive leadership influences pro-environmental behaviors through a climate for green initiative, confirming that climate mediates leadership effects on both task-related and discretionary environmental actions (Thabet et al., 2023). Green psychological climate also mediates the relationship between green human resource management and employee green behavior, with green transformational leadership serving as a boundary condition that strengthens this indirect pathway (Li et al., 2025). These convergent findings establish that green psychological climate functions as a psychological bridge converting organizational environmental signals into individual behavioral responses.

Conceptually, green psychological climate functions as a proximal mechanism bridging leadership cues with behavior by encoding expectations about what is appropriate and valued in the work unit (Norton et al., 2017; Zacher et al., 2023). The proposed mediation logic operates as follows. Green transformational leadership provides ecological vision, models sustainable behavior, and communicates moral meaning (Peng et al., 2021). These leader signals lead employees to assess organizational seriousness about environmental priorities and form aligned climate perceptions (Iqbal et al., 2023). When these perceptions crystallize into shared climate beliefs, norms, support, and social consequences for acting sustainably become clear, increasing behavioral frequency (Norton et al., 2017). Work contexts that provide adequate social support and autonomy strengthen psychological incentives to act, making the climate-behavior relationship more definitive and consistent over time (Katz et al., 2023). This psychological chain connecting leadership, climate formation, and behavioral manifestation provides the theoretical foundation for the present study.

The literature establishes that green transformational leadership shapes employee environmental behaviors through multiple pathways, with green psychological climate serving as a critical mediating mechanism. However, empirical tests of this mediation in hospitality settings remain limited, and whether these relationships differ between front-of-house and back-of-house employees has not been systematically examined. Building on this theoretical foundation, this study examines how green transformational leadership influences employee green behavior through the mediating role of green psychological climate in Indonesian hotels, and investigates whether these relationships differ between front-of-house and back-of-house employees. Therefore, four research hypotheses are formulated as follows.

H1: Green transformational leadership is positively related to employee green behavior.

H2: Green transformational leadership is positively related to green psychological climate.

H3: Green psychological climate is positively related to employee green behavior.

H4: Green psychological climate mediates the influence of green transformational leadership on employee green behavior.

2. METHODOLOGY

2.1. Sample and data collection

This study employed an explanatory design with a cross-sectional survey across 36 three-star hotels in three mass tourism destination corridors in the Lake Toba region, North Sumatra Province, Indonesia. Hotels were purposively selected based on established environmental management systems that included documented policies and systematic implementation of sustainability practices, such as energy efficiency, water conservation, and waste management, as 24-hour operations with dense standard operating procedures make collective norms a behavioral lever at the unit level. Respondents were non-managerial employees and supervisors from front-of-house and back-of-house with a minimum tenure of 12 months to ensure adequate exposure to systems and work norms.

Data collection was conducted online and offline through coordination with the HR departments of each hotel during the first quarter of 2025, facilitated by trained graduate student enumerators who were independent of hotel management. A total of $N = 412$ valid questionnaires were collected with a response rate of 62%. Respondent composition was 53.2% male and 46.8% female; mean age was 29.7 years (SD = 6.2); mean tenure was 3.7 years (SD = 3.1); and 58% were from front-of-house. The relatively balanced proportion of front-of-house and back-of-house is important because variation in employee green behavior in hotels is influenced by unit- or department-level factors, making functional composition relevant for interpretation of results (Chou, 2014). The demographic summary is presented in Table 1, and the complete list of participating hotels is provided in Appendix A. The data collected for this study are unique to this manuscript.

Table 1. Respondent characteristics (N = 412, 36 hotels)

Variable	Category	n	%
Gender	Male	219	53.2
	Female	193	46.8
Age	< 25 years	107	26.0
	25–34 years	202	49.0
	35–44 years	78	18.9
	≥ 45 years	25	6.1
Tenure	< 2 years	128	31.1
	2–5 years	185	44.9
	> 5 years	99	24.0
Function	FOH	239	58.0
	BOH	173	42.0
Education	High School/Equivalent	74	18.0
	Diploma	132	32.0
	Bachelor's	181	43.9
	Postgraduate	25	6.1

2.2. Ethical considerations

This study received ethical clearance through the institutional review process of the TALENTA Research Grant 2025 at Universitas Sumatera Utara. The research protocol was reviewed and approved by the Faculty of Economics and Business research committee prior to data collection. Participation was voluntary and anonymous. The

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cover letter explained the academic purpose, participants' rights to not answer or withdraw participation at any time, privacy protection, and brief debriefing procedures. Respondents were assigned unique numerical codes to ensure anonymity, and no personally identifiable information was collected. Trained graduate student enumerators who were independent of hotel management conducted on-site data collection while respecting respondent privacy. Employees were explicitly informed that their responses would not be shared with supervisors and that participation would not affect their employment status.

2.3. Measures

Measurement scales were selected based on established psychometric properties and prior validation in organizational and hospitality research. Several design features were incorporated to reduce common method variance. Construct blocks were psychologically separated and presented in randomized order with neutral instructions. Items used a symmetric five-point response format (1 = strongly disagree to 5 = strongly agree) to balance response discrimination with cognitive ease. All scales were translated into Bahasa Indonesia using back-translation procedures to ensure semantic equivalence. Green transformational leadership was measured using eight items from Robertson (2018), capturing inspirational motivation, intellectual stimulation, individualized consideration, and idealized influence with environmental content. Green psychological climate was measured using six items from Norton et al. (2014), capturing employee perceptions of environmental support and priorities at the work unit level. This construct was treated as a collective property and aggregated to the hotel level after establishing within-unit agreement through rwg(j), ICC(1), and ICC(2) diagnostics (LeBreton & Senter, 2008). Employee green behavior was operationalized as a composite construct comprising task-related green behavior (four items from Norton et al., 2014) and organizational citizenship behavior for the environment (six items from Boiral & Paillé, 2012), reflecting both prescribed and discretionary environmental actions (Zacher et al., 2023). The complete measurement instrument is provided in Appendix B. Post-collection diagnostics assessed potential common method bias. Variance inflation factors at the construct level ranged from 1.121 to 2.593, all below the 3.3 threshold recommended for PLS-SEM (Kock, 2015). Harman's single-factor test showed the first unrotated factor accounted for 35.3% of total variance, below the 50% threshold (Podsakoff et al., 2003). These results confirm that common method variance was not a serious concern. Full collinearity assessment results are presented in Appendix C.

2.4. Data analysis

Data analysis was conducted using SmartPLS 4 following current PLS-SEM guidelines (Sarstedt et al., 2022). The measurement model was evaluated through multiple criteria. Outer loadings were required to exceed 0.70, internal consistency was assessed through Composite Reliability and Cronbach's alpha with minimum values of 0.70, and convergent validity was evaluated using average variance extracted with a minimum of 0.50 (Hair et al., 2021). Discriminant validity was examined using the heterotrait-monotrait ratio with a conservative threshold below 0.85, supplemented by the Fornell–Larcker criterion in which the square root of each construct's AVE should exceed its correlations with other constructs (Henseler et al., 2015). Variance inflation factors in the outer model were examined to assess multicollinearity at the indicator level.

In the structural model, path coefficients were estimated using 5,000 bootstrap subsamples with 95% bias-corrected and accelerated confidence intervals. Results included coefficient significance, Cohen's f^2 for effect sizes, R^2 for explanatory power, and Stone–Geisser's Q^2 for predictive relevance calculated through the blindfolding procedure. Multi-group analysis compared front-of-house and back-of-house employees after establishing measurement invariance through MICOM testing of configural and compositional invariance (Henseler et al., 2016). Group differences in path coefficients were interpreted based on bootstrap confidence interval overlap.

3. RESULTS

Table 2 presents means, standard deviations, skewness, and kurtosis for each construct. Skewness values ranged from −0.06 to −0.01, and kurtosis

values ranged from −0.32 to −0.27, both within acceptable ranges for relatively symmetric distributions with mild non-normality. Such deviations pose no constraints for partial least squares structural equation modeling, permitting measurement and structural model evaluation (Hair et al., 2021).

Table 2. Descriptive statistics

Variable	M	SD	Skewness	Kurtosis
GTL	2.98	0.93	−0.01	−0.32
GPC	2.97	0.94	−0.06	−0.27
EGB	3.01	0.93	−0.05	−0.28

Note: N = 412. M = Mean; SD = Standard Deviation. GTL = Green Transformational Leadership; GPC = Green Psychological Climate; EGB = Employee Green Behavior.

Table 3 presents outer loadings, reliability coefficients, and average variance extracted for measurement model evaluation. Outer loadings ranged from 0.737 to 0.856, with all indicators loading strongly on their respective constructs and no items requiring removal. Cronbach's alpha values (0.900 to 0.927) and Composite Reliability values (0.923 to 0.938) demonstrated high internal consistency. Average variance extracted values (0.602 to 0.667) exceeded the 0.50 threshold, satisfying reliability and convergent validity criteria for partial least squares structural equation modeling.

Discriminant validity was established through two criteria. Table 4 shows all Heterotrait-Monotrait Ratio values below the conservative 0.85 threshold, with the highest value of 0.643 between green psychological climate and green transformational leadership (Henseler et al., 2015). The Fornell–Larcker criterion was also satisfied, with the square root of average variance extracted on the diagonal exceeding all inter-construct correlations (employee green behavior = 0.776; green psychological climate = 0.816; green transformational leadership = 0.781). Both criteria confirm construct distinctiveness.

Collinearity assessment at the indicator level showed Variance Inflation Factor values ranging from 1.772 to 2.593, all below the 3.3 threshold (see Appendix C for details), confirming no problematic multicollinearity (Hair et al., 2021;

Table 3. Measurement model: Loadings, reliability, and convergent validity

Construct	Item	Loadings	α	CR	AVE
Employee Green Behavior	EGB1	0.777	0.927	0.938	0.602
	EGB2	0.783			
	EGB3	0.793			
	EGB4	0.765			
	EGB5	0.789			
	EGB6	0.779			
	EGB7	0.749			
	EGB8	0.767			
	EGB9	0.777			
	EGB10	0.779			
Green Psychological Climate	GPC1	0.856	0.900	0.923	0.667
	GPC2	0.842			
	GPC3	0.798			
	GPC4	0.807			
	GPC5	0.827			
	GPC6	0.766			
Green Transformational Leadership	GTL1	0.819	0.908	0.926	0.610
	GTL2	0.737			
	GTL3	0.773			
	GTL4	0.746			
	GTL5	0.761			
	GTL6	0.813			
	GTL7	0.804			
	GTL8	0.790			

Note: α = Cronbach's Alpha; CR = Composite Reliability; AVE = Average Variance Extracted. All loadings > 0.70, α > 0.70, CR > 0.70, AVE > 0.50 indicate adequate reliability.

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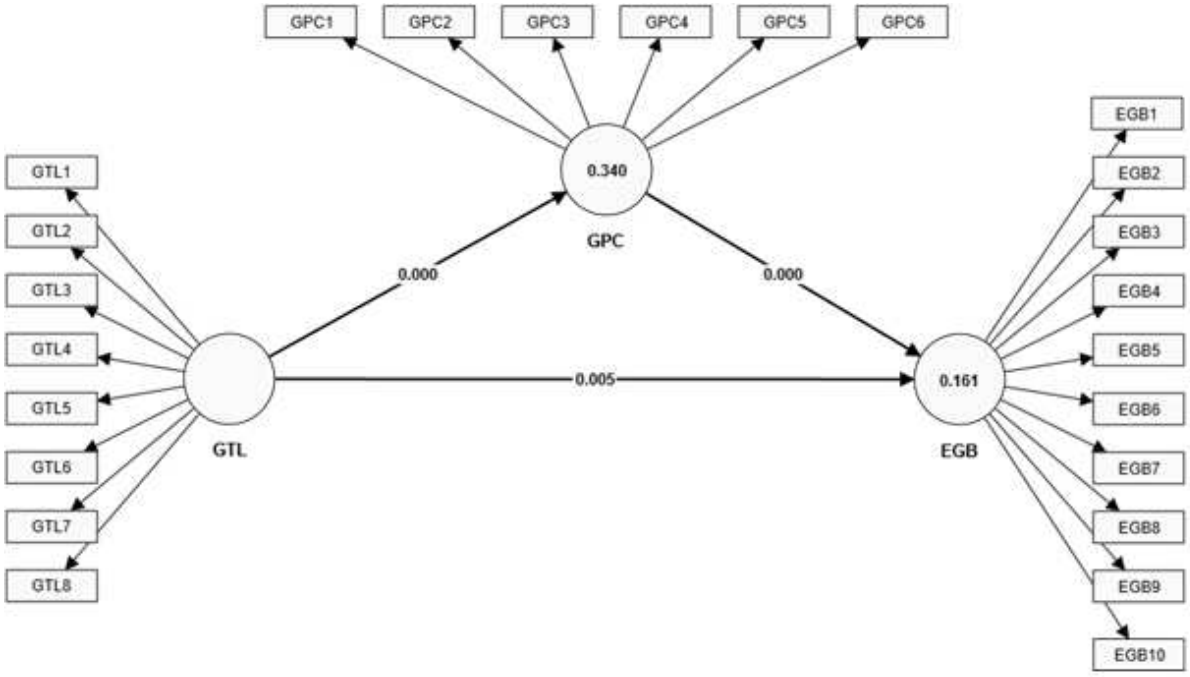

Note: EGB = Employee Green Behavior; GPC = Green Psychological Climate; GTL = Green Transformational Leadership.

Figure 1. Inner model

Table 4. Discriminant validity

Method	Construct	EGB	GPC	GTL
HTMT	EGB	–		
	GPC	0.410	–	
	GTL	0.353	0.643	–
Fornell–Larcker	EGB	0.776		
	GPC	0.379	0.816	
	GTL	0.327	0.583	0.781

Note: HTMT = Heterotrait-Monotrait Ratio; EGB = Employee Green Behavior; GPC = Green Psychological Climate; GTL = Green Transformational Leadership. Diagonal values (bold) in the Fornell–Larcker section represent √AVE.

Diamantopoulos & Siguaw, 2006). With acceptable measurement properties established, analysis proceeded to the structural model. Figure 1 displays the estimated relationships among constructs according to study hypotheses.

Table 5 reports path coefficients, standard errors, *t*-statistics, and 95% bias-corrected and accelerated confidence intervals from 5,000 bootstrap subsamples. These relationships are visualized in Figure 1.

The structural model supported all four hypotheses. Green transformational leadership strongly influenced green psychological climate (β = 0.583, $p < 0.001$), with a large effect size ($f^2 = 0.514$). The direct path from leadership to employee green behavior was weaker but significant (β = 0.161, $p < 0.01$, $f^2 = 0.020$). Green psychological climate also predicted employee green behavior (β = 0.285, $p < 0.001$, $f^2 = 0.064$). Mediation analysis confirmed a significant indirect effect through green psychological climate (β = 0.166, $p < 0.001$). Combining direct and indirect paths yielded a total effect of 0.327, with roughly half transmitted through climate perceptions. Because the direct path remained significant alongside the indirect path, the mediation pattern is partial rather than full.

Table 6 presents aggregation diagnostics justifying hotel-level analysis of green psychological climate (LeBreton & Senter, 2008). Within-unit agreement was adequate (mean rwg(j) = 0.78, range: 0.65–0.92), and ICC values confirmed

Table 5. Structural model: Path coefficients and effect sizes

Path	β	SE	t	95% CI	f^2
H1: GTL → EGB	0.161	0.057	2.822**	[0.048; 0.273]	0.020
H2: GTL → GPC	0.583	0.032	18.196***	[0.514; 0.643]	0.514
H3: GPC → EGB	0.285	0.056	5.100***	[0.170; 0.387]	0.064
H4: GTL → GPC →EGB	0.166	0.033	4.973***	[0.099; 0.229]	–

Note: N = 412. β = standardized path coefficient; SE = standard error; CI = bias-corrected confidence interval; f^2 = Cohen's effect size (0.02 = small, 0.15 = medium, 0.35 = large). GTL = Green Transformational Leadership; GPC = Green Psychological Climate; EGB = Employee Green Behavior. *p < 0.05; **p < 0.01; ***p < 0.001.

Table 6. Aggregation justification (K = 36)

Statistic	Value	Threshold	Interpretation
Mean rwg(j)	0.78	> 0.70	Adequate
rwg(j) range	0.65–0.92	–	Acceptable
ICC(1)	0.60	> 0.05	Strong
ICC(2)	0.90	> 0.70	Excellent
Mean unit size	11.4 (8–15)	> 3	Adequate

Note: N = 412 across K = 36 hotels. rwg(j) = within-group agreement; ICC(1) = between-unit variance; ICC(2) = unit mean reliability. Values support aggregation (LeBreton & Senter, 2008).

Table 7. Model fit indices

Index	Value	Threshold	Interpretation
SRMR	0.042	< 0.08	Good fit
NFI	0.935	> 0.90	Good fit
R^2(GPC)	0.340	–	Substantial
R^2(EGB)	0.161	–	Moderate
Q^2 (GPC)	0.223	> 0	Predictive
Q^2 (EGB)	0.094	> 0	Predictive

Note: GPC = Green Psychological Climate; EGB = Employee Green Behavior; R^2 = coefficient of determination; Q^2 = predictive relevance (values > 0 indicate predictive capability); SRMR = standardized root mean square residual; NFI = normed fit index.

strong between-unit variance (ICC(1) = 0.60) alongside excellent unit mean reliability (ICC(2) = 0.90). Units averaged 11.4 employees (range: 8–15), providing a sufficient sample size for reliable aggregation. These diagnostics collectively support analyzing green psychological climate as a unit-level construct.

Model quality indicators appear in Table 7. Green transformational leadership explained substantial variance in green psychological climate (R^2 = 0.340), while the combined effects of leadership and climate accounted for modest variance in employee green behavior (R^2 = 0.161). Both constructs demonstrated predictive relevance (Q^2 = 0.223 and 0.094, respectively). Model fit indices confirmed adequate specification, with SRMR = 0.042 (< 0.08 threshold) and NFI = 0.935 (> 0.90 threshold), supporting a well-calibrated model (Hair et al., 2021; Henseler et al., 2016).

Multi-group analysis tested whether structural relationships differed between front-of-house and back-of-house employees. Measurement invariance testing through MICOM procedures preceded path comparisons. All constructs achieved configural invariance, indicating the same items were used across groups, and compositional invariance, indicating constructs had similar meaning across groups. Green psychological climate failed mean and variance equivalence in Step 3, resulting in partial invariance. This pattern suggests groups may differ in mean climate levels but maintain similar structural relationships, which is adequate for comparing path coefficients (Henseler et al., 2016). Results appear in Table 8.

No significant differences between front-of-house and back-of-house employees emerged across structural paths (all $p > 0.05$). The largest difference occurred in the green psychological climate

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Table 8. Multi-group analysis (MGA)

Path	β (FOH)	β (BOH)	Δβ	p-value
GTL → EGB	0.088	0.255	−0.167	0.155
GTL → GPC	0.594	0.565	0.029	0.647
GPC → EGB	0.369	0.166	0.202	0.064

Note: N = 412 (FOH = 239, BOH = 173). FOH = Front-of-House; BOH = Back-of-House; Δβ = difference (FOH − BOH); p = two-tailed p-value. No significant differences (all p > 0.05). All constructs achieved configural and compositional invariance.

to employee green behavior path (Δβ = 0.202, p = 0.064), suggesting a tendency for slightly stronger climate effects in front-of-house roles, though this failed to reach conventional significance.

4. DISCUSSION

The findings indicate that green transformational leadership is positively associated with employee green behavior, although the strength of this relationship is relatively limited. The direct effect is statistically significant but small in magnitude (β = 0.161; f^2 = 0.020), suggesting that leadership behaviors such as role modeling and the communication of environmental values can encourage environmentally responsible actions, but their influence is constrained when operating on their own. This pattern is consistent with earlier studies reporting modest direct effects of green leadership on employee behavior, particularly in organizational settings characterized by formalized procedures and stable routines (e.g., Kim et al., 2020; Robertson, 2018). In hotel operations, where work processes are highly standardized, leadership cues may initiate green behavior but appear insufficient to sustain it without additional contextual support.

Greater explanatory power emerges when attention is directed to the role of leadership in shaping the psychological environment of the workplace. The relationship between green transformational leadership and green psychological climate represents the strongest path in the model (β = 0.583; f^2 = 0.514). This finding suggests that the primary influence of green leadership lies in shaping how employees collectively interpret organizational priorities and environmental support. Rather than directly controlling behavior, leaders appear to function as sense-givers who translate abstract environmental commitments into shared expectations. This interpretation aligns with the perspective advanced by Norton et al. (2014), who emphasize psychological climate as a key mechanism through which sustainability initiatives acquire meaning at the employee level.

Once established, green psychological climate plays a substantive role in guiding employee behavior. The association between green psychological climate and employee green behavior is moderate in size (β = 0.285; f^2 = 0.064), indicating that clarity of environmental procedures, consistency in implementation, and visible organizational support increase the likelihood of environmentally responsible actions. This result supports prior evidence showing that psychological climate operates as a proximal contextual influence on employee green behavior, complementing rather than replacing individual dispositions and job characteristics (Katz et al., 2022).

These relationships point to a partially mediated process in which leadership influence is primarily transmitted through collective perceptions. The indirect effect of green transformational leadership on employee green behavior via green psychological climate (β = 0.166) accounts for a substantial share of leadership influence, while the direct pathway remains present but comparatively weak (β = 0.161; f^2 = 0.020). This configuration is consistent with dual process perspectives on leadership, which propose that behavioral outcomes are shaped both through interpersonal influence and through shared norms embedded in the work environment (Zhang et al., 2021). In organizations where environmental management practices are already institutionalized, collective mechanisms appear to play a more prominent role than direct leadership intervention.

The absence of significant differences between front-of-house and back-of-house employees further underscores the contextual nature of these mechanisms. The stability of the structural relationships across functional roles suggests that consistency in systems, standard operating procedures, and environmental communication reduces the relevance of task-based

distinctions. This finding echoes prior research indicating that strong green climates foster shared behavioral expectations that extend across occupational boundaries (Zientara & Zamojska, 2018), and it provides additional evidence from the context of mass tourism hotels in Indonesia.

The contrast between the large effect of leadership on green psychological climate and the small direct effect of leadership on employee green behavior highlights the way green transformational leadership operates in practice. Leadership influence appears to be exercised less through direct behavioral control and more through the construction of a supportive psychological environment in which environmental norms are internalized and enacted by employees in their routine work activities.

CONCLUSION

Green transformational leadership emerges in this study as a central driver of employee green behavior in hotel organizations, primarily through its influence on the psychological climate of the workplace. The findings indicate that leadership effects are largely embedded in shared interpretations of environmental priorities, rather than operating solely through direct supervisory control. Nonetheless, leadership influence does not disappear at the interpersonal level, suggesting that role modeling and individualized guidance remain relevant even where environmental systems are already established.

The lack of differentiation between front-of-house and back-of-house employees further indicates that environmentally responsible behavior in hotels is shaped less by functional visibility or task exposure and more by the consistency of organizational signals and routines. This pattern points to the importance of organization-wide environmental practices that cut across operational boundaries, rather than function-specific interventions.

Future research could explore how differences in ownership arrangements, competitive positioning, or the maturity of environmental initiatives condition leadership influence over time. Additional attention to psychological mechanisms beyond climate perceptions may also help clarify how supervisory actions translate into sustained employee behavior. Such extensions would contribute to a more refined understanding of environmental leadership in service organizations.

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APPENDIX A

Table A1. Participating three-star hotels by tourism corridor

No.	Hotel	Location
	Corridor 1: Parapat/Ajibata	
1	KHAS Parapat Hotel	Parapat
2	Niagara Hotel Lake Toba & Resorts	Parapat
3	Danau Toba International Cottage	Parapat
4	Pandu Lakeside Hotel Parapat	Parapat
5	Inna Parapat Hotel	Parapat
6	Hotel Patra Parapat	Parapat
7	Quality Hotel Siantar–Parapat	Parapat
8	Parapat View Hotel	Parapat
9	Grand Tamaro Hotel	Parapat
10	Hotel Toba Nauli	Parapat
11	Melissa Palace Hotel	Parapat
12	Star Hotel Parapat	Parapat
	Corridor 2: Samosir (Tuktuk/Pangururan)	
13	Samosir Cottages Resort	Samosir
14	Samosir Villa Resort	Samosir
15	Toba Village Inn	Tuktuk
16	Toledo Inn	Tuktuk
17	Toba Beach Hotel	Tuktuk
18	Hotel Barbara	Tuktuk
19	Pandu Lakeside Hotel Tuktuk	Tuktuk
20	JTS Hotel Pangururan	Pangururan
21	Carolina Hotel Tuktuk	Tuktuk
22	Mas Cottages Tuktuk	Tuktuk
23	Zoe's Paradise Waterfront Hotel	Tuktuk
24	Simangande View & Resto	Samosir
	Corridor 3: Balige/Haranggaol/Tigaras	
25	Labersa Hotel & Convention Center Toba	Balige
26	Hotel Tiara Bunga	Balige
27	Gemma Hotel Balige	Balige
28	Purnama Balige Hotel	Balige
29	Nabasa Hotel Balige	Balige
30	Sinar Minang Hotel Balige	Balige
31	Hotel O Balige City	Balige
32	Damar Toba Eco Resort	Balige
33	Agape Hotel Haranggaol	Haranggaol
34	Hotel Haranggaol View	Haranggaol
35	Ardhana Hotel Tigaras	Tigaras
36	Hotel Tigaras Indah	Tigaras

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APPENDIX B

Table B1. Measurement instrument

Construct	Dimension	Item	Source
Green Transformational Leadership			
GTL1	Idealized Influence	My supervisor articulates a clear environmental vision for our unit.	Robertson (2018)
GTL2		My supervisor acts as a role model for environmentally friendly work behavior.	
GTL3	Intellectual Stimulation	My supervisor encourages us to seek creative solutions (eco-innovation) to reduce environmental impact.	
GTL4		My supervisor encourages team learning related to green practices.	
GTL5	Inspirational Motivation	My supervisor communicates priorities for reducing energy, water, and waste consumption.	
GTL6		My supervisor consistently practices green SOPs in daily operations.	
GTL7	Individualized Consideration	My supervisor provides individual guidance to enhance green competencies.	
GTL8		My supervisor provides specific feedback on our team's green performance.	
Green Psychological Climate			
GPC1	Climate	Environmental goals in my unit are communicated clearly.	Norton et al. (2014)
GPC2		In my unit, support for green practices is visible through directions, work priorities, and implementation assistance.	
GPC3		Operational procedures related to energy, water, and waste are explained in detail for my tasks.	
GPC4		Green operating standards are applied consistently across every shift.	
GPC5		Resources and tools needed to implement green procedures are available.	
GPC6		Feedback and follow-up on green practices are provided regularly.	
Employee Green Behavior			
EGB-IR1	In-Role	I comply with energy-saving SOPs during my duties.	Norton et al. (2014)
EGB-IR2		I comply with water conservation SOPs during my duties.	
EGB-IR3		I implement waste sorting according to procedures.	
EGB-IR4		I report any leaks or inefficiencies that I discover.	
EGB-OCBE1	OCBE	I help colleagues apply green practices (eco-helping).	Boiral and Paillé (2012)
EGB-OCBE2		I propose green initiatives (eco-initiatives) to my supervisor.	
EGB-OCBE3		I participate in internal green activities (eco-civic engagement).	
EGB-OCBE4		I serve as an informal green champion in my team.	
EGB-OCBE5		I maintain and update green cues (posters, labels) in my work area.	
EGB-OCBE6		I mentor new colleagues on proper green practices.	

APPENDIX C

Table C1. Collinearity (VIF)

Construct	Item	VIF (Outer)
Employee Green Behavior	EGB1	2.152
	EGB2	2.093
	EGB3	2.164
	EGB4	2.000
	EGB5	2.293
	EGB6	2.118
	EGB7	1.913
	EGB8	1.998
	EGB9	2.075
	EGB10	2.100
Green Psychological Climate	GPC1	2.593
	GPC2	2.512
	GPC3	2.143
	GPC4	2.065
	GPC5	2.285
	GPC6	1.819
Green Transformational Leadership	GTL1	2.288
	GTL2	1.772
	GTL3	1.937
	GTL4	1.822
	GTL5	1.947
	GTL6	2.265
	GTL7	2.200
	GTL8	2.089

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