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Leading green, acting green: How green commitment mediates and environmental self-efficacy moderates the eco-centric leadership-OCBE relationship in eco-friendly hotels

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Purpose: This study aims to explore the mechanisms by which eco-centric leadership (Eco-L) influences Organizational Citizenship Behavior for the Environment (OCBE) among employees in Saudi eco-friendly hotels. It investigates the mediating role of green commitment (G-Com) and the moderating role of environmental self-efficacy (ESE) within this relationship.

Design/Methodology/Approach: The study employs a cross-sectional survey design using a structured questionnaire to collect data from employees working in five-star eco-certified hotels in Saudi Arabia. This design involved gathering data at a single point in time to capture employees' perceptions and attitudes. The proposed conceptual model was tested using PLS-SEM.

Findings: The results reveal that Eco-L has a positive and significant effect on OCBE. Furthermore, green commitment (G-Com) significantly mediates this relationship, indicating that employees' psychological attachment to green values enhances their voluntary environmental behaviors. In addition, ESE positively moderates the relationship between Eco-L and OCBE, suggesting that the impact of eco-centric leadership is stronger among employees with greater confidence in their environmental capabilities.

Originality/Value: This study makes a novel contribution by integrating Social Exchange Theory (SET) and Social Cognitive Theory (SCT) to explain the psychological and behavioral mechanisms linking leadership to pro-environmental behavior. While prior research has examined green commitment as a mediator and environmental self-efficacy as a moderator separately, this study is among the first to simultaneously explore these constructs within the combined SET and SCT framework. Furthermore, it applies this integrated approach specifically to the hospitality industry's eco-friendly hotel sector in Saudi Arabia—an underexplored context. The findings provide valuable insights into sustainable human resource management and leadership practices in this setting.

KEYWORDS

eco-leadership, green leadership, environmental commitment, responsible behavior, extra-role behavior, hospitality industry

1 Introduction

The growing global emphasis on environmental sustainability has encouraged organizations to implement eco-friendly practices (Hasan et al., 2024; Malik et al., 2021). The hospitality industry, in particular, faces increased pressure to minimize its ecological footprint due to its substantial use of energy, water, and raw materials (Abdou et al., 2022a; Biswas et al., 2022). This high resource consumption significantly contributes to environmental issues, including carbon emissions, excessive waste, and resource depletion (Hawela et al., 2025; Vu et al., 2025). For instance, recent estimates suggest that the hospitality industry accounts for approximately 1% of annual global carbon dioxide emissions, with hotels consuming up to eight times more water and energy than surrounding local communities (Lee, 2024; Menegaki, 2025). Water consumption is particularly high, reaching as much as 1,500 liters per occupied room per day in luxury establishments equipped with facilities such as pools, spas, and extensive laundry services (Menegaki, 2025). Waste generation is another critical concern, as hotels worldwide produce approximately 289,700 tons of waste annually, including single-use plastics, food waste, and recyclable materials, much of which ends up in landfills, contributing to environmental degradation (Business waste, 2025). These urgent environmental challenges call for transformative leadership approaches in high-impact industries such as hospitality, which is known for its substantial resource consumption and significant environmental footprint (Abdou et al., 2023).

Leadership plays a crucial role in helping hospitality organizations achieve sustainable growth and responsible practices (Janjua et al., 2025; Iftikhar et al., 2024). Eco-centric leadership (Eco-L) stands out as a transformative model that embeds environmental responsibility and sustainability into organizational decision-making, balancing business goals with ecological concerns (Hasan et al., 2024; Araujo et al., 2022; Biswas et al., 2022). Unlike traditional leadership focused solely on profit, Eco-L prioritizes sustainability and strives to harmonize human development with nature (Zafar et al., 2023; Al-Amin et al., 2021). Its focus on ecological responsibility makes it an effective framework for promoting sustainable practices and encouraging green behavior (Biswas et al., 2022; Zafar et al., 2023; Uddin et al., 2021).

Organizational citizenship behavior toward the environment (OCBE) refers to discretionary, voluntary actions by employees that contribute to environmental sustainability but fall outside formal job requirements (Boiral and Paillé, 2012). Drawing on Boiral and Paillé (2012, p. 442), OCBE is categorized into three dimensions: “Eco-initiative,” “Eco-civic engagement,” and “Eco-helping.” Eco-initiative refers to discretionary behaviors aimed at suggesting improvements to eco-centric activities or environmental effectiveness. Further, eco-civic engagement comprises employees’ voluntary involvement in organizational environmental efforts and activities. Lastly, eco-helping represents voluntarily supporting coworkers in incorporating ecological issues into daily work routines. This behavior is vital for fostering an environmentally sustainable workplace, particularly in industries like hospitality, where employee actions directly impact ecological outcomes (He et al., 2019; Malik et al., 2021).

Previous studies have shown that various leadership styles positively impact OCBE. Leadership approaches like environmental-transformational leadership (Kim et al., 2020; Gurmani et al., 2021), environmentally specific servant leadership (Luu, 2019), green inclusive leadership (Abdou et al., 2023; Mandal and Pal, 2024), responsible leadership (Zhao and Zhou, 2019), sustainable leadership (Mandal and Pal, 2025), and eco-centric leadership (Zafar et al., 2023) all encourage employees to engage in voluntary and proactive environmental behaviors. These styles focus on aligning organizational goals with sustainability and motivating employees through vision, support, and inclusivity (Abdou et al., 2023; Zafar et al., 2023). However, how Eco-centric Leadership (Eco-L) influences OCBE in the hospitality industry remains understudied. This relationship may be shaped by green commitment (G-Com) as a key mechanism and environmental self-efficacy (ESE) as an important moderating factor.

Green commitment (G-Com) is the dedication of individuals or organizations to environmental sustainability (Nasir et al., 2023). It involves proactive efforts to reduce ecological impacts, conserve resources, and promote sustainability (Hayyat et al., 2023; Suleman et al., 2024). This commitment is evident through policies and actions aimed at addressing environmental issues like climate change and resource depletion (Sugiarto and Huruta, 2023). Studies show that effective leadership plays a key role in enhancing G-Com by promoting a sustainability-focused culture (Abbas et al., 2022; Orgun et al., 2024). Eco-leadership styles encourage employees to adopt environmental values and engage in eco-friendly initiatives, strengthening their commitment to sustainability (Yang and Zhang, 2023).

Environmental self-efficacy (ESE), also known as green self-efficacy (GSE), reflects an individual’s confidence in their ability to perform environmentally conscious activities (Mughal et al., 2022). People with high ESE/GSE are more likely to take part in pro-environmental actions because they believe they have the skills and knowledge to make a difference (Musaddiq et al., 2024; Mughal et al., 2022; Qasim et al., 2024). In contrast, those with low ESE may avoid sustainability efforts due to self-doubt (Faraz et al., 2021). Research shows that ESE/GSE often acts as a mediator between green leadership and pro-environmental behavior (PEB) across various industries. For example, in Saudi hospitality, GSE mediates the link between green transformational leadership (GTL) and PEB (Qasim et al., 2024). Further, in Pakistan’s energy sector, GSE mediates the linkage between green servant leadership and PEB (Faraz et al., 2021). In addition, in the iron and steel industry, GSE influences the connection between environmental leadership and PEB (Ahuja et al., 2023). All studies agree that GSE/ESE has a partial mediating effect on leadership’s impact on PEB.

From the previous findings, while prior research has examined the role of various green-oriented leadership styles in fostering pro-environmental behaviors (e.g., Gurmani et al., 2021; Luu, 2019; Abdou et al., 2023; Zhao and Zhou, 2019; Mandal and Pal, 2024, 2025), few studies have focused specifically on Eco-L and its influence on OCBE in the hospitality sector. Existing studies on Eco-L have primarily been conducted in non-hospitality contexts or outside the Middle East (e.g., Zafar et al., 2023; Hasan et al., 2024), leaving a knowledge gap on how this

leadership approach functions in tourism-dependent economies where cultural norms, regulatory frameworks, and environmental priorities differ significantly. Moreover, much of the green leadership literature treats environmental self-efficacy (ESE) as a mediator rather than exploring its potential role as a boundary condition that strengthens or weakens leadership effects. This study addresses these gaps by introducing green commitment (G-Com) as a mediating mechanism and examining ESE as a moderator in the Eco-L–OCBE relationship.

Focusing on eco-certified hotels in Saudi Arabia offers further originality. The Saudi hospitality sector operates under unique environmental and socio-cultural conditions: rapid tourism expansion under Vision 2030, a predominantly expatriate workforce, and the government's strategic emphasis on sustainable destination branding (Abdou et al., 2022b). Unlike Western or East Asian contexts, where environmental regulation is more mature, Saudi eco-hotels navigate a developing sustainability framework while balancing service excellence with resource conservation in a desert climate. These contextual features make Saudi eco-hotels an ideal setting to explore how Eco-L translates into voluntary environmental behaviors, thereby extending the applicability of both Social Exchange Theory (SET) and Social Cognitive Theory (SCT) to a culturally distinctive and underexplored hospitality environment.

As a result, responding to earlier scholarly calls by Hasan et al. (2024), Zafar et al. (2023), and Faraz et al. (2021) to empirically explore various mechanisms and moderators that may influence the intersection between Eco-L and OCBE in different contexts, this study, grounded in social exchange theory (SET) and social cognitive theory (SCT), aims to address this gap by (1) exploring the impact of Eco-L on OCBE and G-Com, (2) investigating the influence of G-Com on OCBE, (3) investigating the role of G-Com as a mediator in the relationship between Eco-L and OCBE, and (4) demonstrating the moderating role of ESE in the Eco-L–OCBE relationship. To achieve these objectives, the study seeks to answer the following questions:

- (1) What is the effect of eco-centric leadership (Eco-L) on employees' G-Com and OCBE?
- (2) How does G-Com influence OCBE?
- (3) To what extent does G-Com mediate the relationship between Eco-L and OCBE?
- (4) To what extent does environmental self-efficacy (ESE) moderate the Eco-L–OCBE relationship?

This study intends to extend existing scholarly literature to multiple contributions. It highlights that Eco-L can drive sustainability efforts within organizations by enhancing employees' commitment to eco-friendly practices. By introducing G-Com as a mediator, the study explains how leaders focused on environmental issues inspire employees to adopt sustainable behaviors, boosting their OCBE. The study also examines ESE as a moderator to identify when Eco-L is most effective. It suggests that employees with higher ESE are better at turning green leadership into positive voluntary PEB. In contrast, those with lower ESE may need more support to engage in PEB. Ultimately, this research offers practical guidance for hospitality organizations aiming to improve their environmental performance.

2 Theoretical background and hypotheses development

2.1 The impact of Eco-L on OCBE

Unlike traditional leadership approaches that prioritize productivity or innovation as primary objectives, Eco-L focuses on cultivating an environmentally engaged workforce that actively participates in sustainable practices (Zafar et al., 2023; Hasan et al., 2024). This style resonates with the growing importance of sustainability in corporate settings, aligning leadership strategies with the urgent need for ecological stewardship (Hernández and Munoz, 2022; Zafar et al., 2023; Biswas et al., 2022). Leaders operating within this framework act as role models, embedding ecological principles into organizational practices and motivating employees to voluntarily adopt responsible/eco-friendly behaviors (Uddin et al., 2021). This dedication to ecological/eco-friendly values empowers employees to take proactive actions that exceed formal role expectations, contributing to broader OCBE.

OCBE is voluntary employee behaviors that exceed their formal duties and responsibilities aimed at promoting the organizational environmental/ecological objectives (Biswas et al., 2022; Zhang et al., 2023). Such behaviors may include conserving resources, advocating for eco-friendly practices, and participating in sustainability initiatives without direct incentives. Research has shown that Eco-L plays a pivotal role in shaping these behaviors by fostering a culture that values sustainability and ecological responsibility (Hasan et al., 2024; Zafar et al., 2023). Leaders who actively support environmental initiatives create a sense of shared purpose, motivating employees to engage in green practices driven by intrinsic values and organizational alignment (Abdou et al., 2023; Mandal and Pal, 2024).

The theoretical underpinnings of Eco-L's impact on OCBE can be understood through the lens of SET. It posits that when employees perceive their leaders consistently focused on advancing ecological sustainability and ethical responsibility, they feel a moral obligation to reciprocate these values through positive voluntary PEB (Blau, 1968). Eco-centric leaders demonstrate care for the environment and the wellbeing of their teams, cultivating loyalty and trust that stimulate employee involvement in organizational green initiatives (Hasan et al., 2024). By instilling a clear vision for sustainability and creating an eco-supportive organizational climate, these leaders inspire employees to internalize environmental goals, resulting in reciprocation by engaging OCBE (Biswas et al., 2022). Building on this foundation, hypothesis one can be articulated as:

H1: Eco-L significantly impacts employees' OCBE.

2.2 The impact of Eco-L on G-Com

Recent empirical investigations have revealed that eco-leadership styles are key drivers of employees' G-Com, playing a crucial role in strengthening their dedication to sustainable environmental practices (Abbas et al., 2022; Orgun et al., 2024).

For example, ethical leadership significantly enhances G-Com by promoting values such as fairness and responsibility to achieve sustainability goals (Hameed et al., 2022). Supporting this view, research involving 448 employees from 5-star hotels in Turkey demonstrated that green leadership positively influences employees' commitment to sustainability. Leaders who actively endorse eco-friendly practices inspire employees to adopt similar values and show greater dedication to sustainability (Orgun et al., 2024). Similarly, a study of 170 Chinese SMEs in the manufacturing sector found that CEO environmentally specific transformational leadership strengthens G-Com among top management. This leadership style focuses on setting clear sustainability goals, modeling eco-friendly behaviors, and empowering teams to take ownership of environmental practices (Yang and Zhang, 2023).

In this study, the nexus between Eco-L and employees' G-Com can also be explored through the lens of SET (Blau, 1968). In the context of Eco-L, employees perceive environmentally friendly leadership actions as organizational support, which they reciprocate through a stronger commitment to sustainability initiatives. More specifically, eco-centric leaders prioritize environmental sustainability, advocate for green initiatives, and foster a workplace culture that values ecological responsibility (Ojo and Fauzi, 2020; Ye et al., 2023). When employees observe these leadership behaviors, they feel obligated to align their values and behaviors with the organization's green vision. This exchange-based relationship strengthens their psychological attachment to sustainability, leading to higher levels of G-Com (Abbas et al., 2022; Luu, 2019; Cop et al., 2020). Based on the above discussion, hypothesis two can be articulated as:

H2: Eco-L significantly impacts employees' G-Com.

2.3 The impact of employees' G-Com on OCBE

Exciting literature documents the positive interplay between employees' G-Com and OCBE. Previous studies have indicated that employees who are emotionally committed to fulfilling their organization's environmental objectives are inclined to exhibit OCBE (Abbas et al., 2022). For example, results based on 222 participants randomly selected from four industrial units in Pakistan concluded that senior management's dedication to environmental objectives is essential, as it significantly enhances environmental performance and promotes green training, subsequently fostering OCBE (Memon et al., 2022). Moreover, data collected from 308 academics across five higher education institutions in Malaysia showed that G-Com had a substantial effect on employees' PEB (Noor Faezah et al., 2024). In addition, Ren et al.'s (2023) study findings stated that voluntary employee green behavior (VEGB) is significantly correlated with employees' affective commitment to the organization. Similarly, in the banking sector context, findings from research conducted in two developing nations, Ecuador and Kazakhstan, indicated that employees' affective commitment significantly promotes voluntary environmental behaviors (VEB), implying that when staff feel emotionally attached to their organization, they are inclined to participate in eco-friendly actions and support responsible/green

initiatives at workplace (Saifulina et al., 2021). Following the previous conclusions, hypothesis three is formulated as follows.

H3: G-Com significantly impacts employees' OCBE.

2.4 The mediating role of G-Com

Exciting literature revealed that eco-leadership emphasizes achieving harmony between organizational goals and environmental sustainability (Hasan et al., 2024). Leaders adopting this style model eco-friendly behaviors, such as eco-centric leaders, set clear environmental goals and cultivate a culture of shared ecological values (Uddin et al., 2021). As role models, they inspire employees to engage in voluntary environmental actions, contributing to promoting employees' OCBE (Abdou et al., 2023; Hasan et al., 2024). Further, eco-centric leaders shape employees' G-Com by embedding sustainability into their vision and practices (Hameed et al., 2022; Orgun et al., 2024). Employees who internalize these values develop a strong sense of obligation and emotional attachment to the organization (Musaddiq et al., 2024; Ren et al., 2023), which motivates them to support its environmental goals. This attachment makes them more likely to engage in OCBE, with G-Com serving as a catalyst that drives proactive, environmentally conscious actions (Song et al., 2023).

Accordingly, based on the previous conclusions and grounded in SET, this study argues that interrelationships in organizations are built upon reciprocal exchange. Eco-centric leaders demonstrate care for both the environment and their employees, foster a culture of trust, and strengthen employee loyalty. In return, employees develop a sense of obligation to align their actions with the environmental values promoted by their leaders, ultimately resulting in increased OCBE. G-Com mediates this relationship by serving as the emotional and psychological link between leadership practices and voluntary environmental behavior. As a result, hypothesis four is proposed as:

H4: G-Com functions as an influential intermediary between Eco-L and employees' OCBE.

2.5 The moderating role of ESE

ESE/GSE signifies the individual's perceived ability to effectively engage in environmentally friendly practices (Mughal et al., 2022). In this research, Social Cognitive Theory (SCT) is employed to conceptualize how ESE impacts the link between eco-centric leadership and OCBE. SCT emphasizes the role of self-efficacy in shaping individuals' behaviors by highlighting the interaction between personal, environmental, and behavioral factors (Bandura, 1999). In the context of eco-centric leadership, SCT explains how employees' ESE—trust in their ability to engage effectively in sustainable practices—moderates the influence of leadership on OCBE (Ahuja et al., 2023; Faraz et al., 2021). Grounded in the lens of SCT, we assume that when employees have greater ESE, they are more likely to translate eco-centric leadership guidance into proactive environmental behaviors effectively. Conversely, those with lower self-efficacy may require stronger leadership

reinforcement to exhibit OCBE. Accordingly, hypothesis five is formulated as follows:

- H5: ESE moderates the positive effect of Eco-L on OCBE, such that this relationship is stronger when ESE is high and weaker when ESE is low.

The study's theoretical framework is presented in [Figure 1](#).

3 Materials and methods

3.1 Sampling determination and data collection

The target population for this study comprised employees working in environmentally friendly five-star hotels in Saudi Arabia. These hotels were selected because of their strong commitment to environmental sustainability, which aligns with the study's focus on eco-centric leadership (Eco-L), green commitment (G-Com), and organizational citizenship behavior for the environment (OCBE) ([Abdou et al., 2023](#)). Hotel selection was based on the ETIC Hotels ranking system, which categorizes properties into gold, silver, and bronze levels according to their sustainability performance ([Abdou et al., 2023](#)).

This research focused exclusively on gold-rated five-star hotels, totaling 28 establishments. Gold-rated properties were intentionally chosen because they demonstrate the highest level of sustainability commitment, ensuring that participants worked in hotels with well-established environmental policies and practices. This created a consistent and relevant context for examining the relationship between Eco-L and pro-environmental behaviors.

A convenience sampling method was used due to practical access limitations. Formal approval from hotel human resource managers or directors was necessary, and only nine of the contacted hotels agreed to participate. Employees from these hotels were invited to complete a self-administered questionnaire. While this sampling approach was essential to gather reliable data within logistical constraints, it was also ensured that all respondents came from hotels with strong sustainability programs.

Following [Nunnally and Bernstein \(1994\)](#) guidance, the sample size for this study was determined while considering the number of items under examination, applying their recommended ratio of 1:10 (item to sample). With 24 items in this study, a sample size of 240 respondents would be considered adequate. Further, this decision also aligns with the recommendation by [Hair et al. \(2019\)](#), which indicates that a minimum sample size of 155 is required for PLS-SEM when expecting minimum path coefficients (P_{min}) between 0.11 and 0.20 at a significance level of 0.05. In addition, it meets [Boomsma's \(1982\)](#) suggestion that a minimum of 200 samples is suitable for structural equation modeling.

Participating staff were asked to review and complete an informed consent form. They were informed about the study's purpose, voluntary participation, and their right to withdraw at any time. Confidentiality and anonymity were assured, and the data were used only for research purposes. A total of 450 questionnaires were distributed (50 per hotel). Of these, 312 were collected, but only 296 (65.8%) were valid for analysis. Responses with missing data or straight-line marking were excluded. The

data collection process took approximately three months, from August to November 2024. [Table 1](#) lists the demographic details of the participants.

3.2 Study measures and survey development

To conduct this research, the researcher followed a quantitative method where data were obtained through a self-administered questionnaire that participants filled out independently. The questionnaire was designed based on established and validated scales from previous studies to ensure reliability and consistency. It consisted of five key sections. The first part focused on obtaining demographic details. The second, third, and fourth sections focused on assessing perceptions of Eco-L, G-Com, ESE, and OCBE, respectively. Participants rated their agreement with statements measuring Eco-L attributes, G-Com, ESE, and OCBE on a five-point Likert scale, "1 = strongly disagree, 5 = strongly agree."

More specifically, the second part focused on assessing employees' perceptions of Eco-L. The 6-item scale used for this assessment was adapted from prior research by [Zafar et al. \(2023\)](#), emphasizing leaders' roles in promoting environmental values, setting sustainability-oriented goals, and inspiring employees to engage in eco-friendly initiatives. Samples of the scale's items are "Our leader inspires the employees with the environmental plans" and "Our leader encourages the employees to achieve environmental targets."

The third section of the questionnaire measured participants' G-Com based on an 8-item scale derived from [Le and Tham \(2024\)](#), based on [Afsar and Umrani \(2020\)](#). Participants were invited to indicate how much they agreed with statements that described their emotional attachment, identification with, and responsibility toward environmental sustainability within their hotels. Examples of these items are "I really care about environmental issues in my hotel," and "I feel it would be a mistake not to support my hotel's environmental efforts."

The fourth section focused on assessing employees' environmental self-efficacy. The ESE scale, derived from [Chen et al. \(2015\)](#), was employed to gauge employees' confidence in executing PEB within the workplace. This six-item scale assesses individuals' perceived competence in engaging in actions that contribute to environmental sustainability. Example items include "I feel competent in effectively handling environmental tasks" and "I can find creative solutions to environmental problems."

The fifth section assessed employees' OCBE using a ten-item scale validated and adapted from [Abdou et al. \(2023\)](#) based on the work of [Boiral and Paillé \(2012\)](#). Items in this section aim to measure employees' voluntary, discretionary behaviors surpassing official work duties and supporting environmental initiatives. Three key dimensions structure the scale, including four items measuring "eco-civic engagement," three assessing "eco-initiatives," and three focusing on "eco-helping." One item for eco-engagement is "I volunteer for projects, endeavors, or events that address environmental issues in my hotel," for eco-helping is "I encourage my colleagues to adopt more environmentally conscious behavior,"

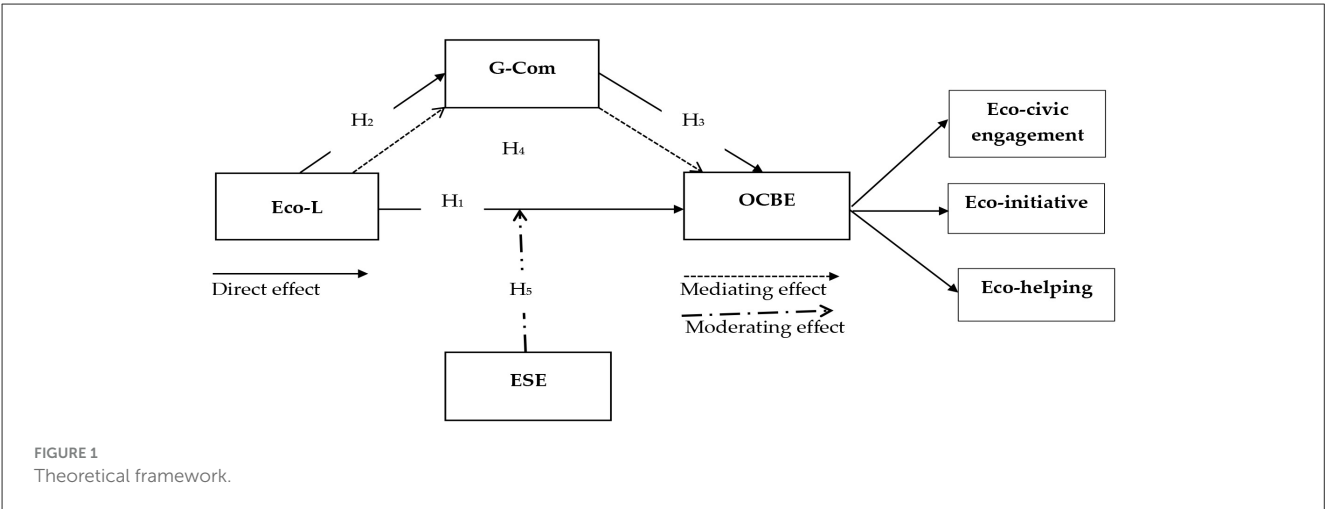


TABLE 1 Demographic attributes of the study’s participants.

Characteristics	No.	%
Gender		
Male	219	74.0
Female	77	26.0
Age		
From 20 to 30 years	101	34.1
From 31 to 40 years	172	58.1
From 41 to 50 years	23	7.8
Level of education		
High school diploma or equivalent	75	25.3
Bachelor’s degree	209	70.6
Postgraduate degree	12	4.1
Department		
Food and Beverage	104	35.1
Rooms division	112	37.8
Maintenance and Engineering	65	22.0
Other	15	5.1
Experience in this hotel		
Less than 3 years	56	18.9
3 to 5 years	196	66.2
< 5 years	44	14.9

N = 296.Top of Form.

and for eco-initiative is “I voluntarily carry out environmental actions and initiatives in my daily work activities.”

After developing the survey in English, it was translated into Arabic to ensure accessibility for native speakers. To maintain accuracy and prevent any alteration of meaning, the questionnaire was then back-translated into English. This process ensured linguistic consistency and conceptual clarity. Moreover, to further validate the questionnaire of the study, four hospitality academics

reviewed its content and provided feedback, verifying that the research tool effectively measured the intended constructs. Their input helped refine the questionnaire, enhancing its clarity and alignment with the study’s objectives. Additionally, a pilot survey was administered to 35 hotel employees who were not involved in the main study. This preliminary test assessed the questionnaire’s feasibility, evaluating its coherence, clarity, and ease of comprehension. The pilot study ensured that the survey items were well-defined, consistently presented, and suitable for measuring Eco-L, employee G-Com, ESE, and OCBE in the hospitality industry context.

3.3 Data analysis

The collected data was analyzed using SPSS version 25 and PLS-SEM version 4.1.0.9. Both measurement and structural models were evaluated. Bootstrap tests were applied to confirm the robustness of the model relationships. PLS-SEM was utilized because of its effectiveness in handling both reflective and formative constructs, making it suitable for complex research models. Furthermore, it is well regarded for its robustness in handling non-normal data and its capacity to analyze intricate models with multiple latent variables and indicators without imposing strict sample size requirements. Additionally, PLS-SEM emphasizes predictive accuracy, making it an effective tool for examining relationships between constructs and forecasting outcomes based on empirical data (Hair et al., 2019).

4 Results

4.1 Measurement model assessment

The measurement model was assessed based on several criteria to ensure its reliability and validity, focusing on convergent and discriminant validity. Convergent validity (CV) was assessed using four criteria. These included outer loading, Cronbach’s alpha, composite reliability (rho_c), and average variance extracted (AVE) (Hair et al., 2019). Results in Table 2 and Figure 2 illustrate that

TABLE 2 Constructs' reliability, and validity measures.

Construct	Items	SFL	VIF	Cronbach's Alpha	Composite reliability (rho_c)	AVE
<i>Eco-centric leadership (Eco-L)</i>	Eco-L1	0.763***	1.944	0.854	0.892	0.578
	Eco-L2	0.752***	1.954			
	Eco-L3	0.796***	2.126			
	Eco-L4	0.761***	1.992			
	Eco-L5	0.757***	1.791			
	Eco-L6	0.732***	1.582			
<i>Green Commitment (G-Com)</i>	G-Com1	0.782***	2.287	0.919	0.935	0.642
	G-Com2	0.708***	1.718			
	G-Com3	0.877***	2.978			
	G-Com4	0.782***	2.072			
	G-Com5	0.787***	2.188			
	G-Com6	0.829***	2.868			
	G-Com7	0.851***	2.891			
	G-Com8	0.786***	2.364			
<i>Environmental Self-efficacy (ESE)</i>	ESE1	0.795***	1.694	0.887	0.914	0.640
	ESE2	0.721***	1.545			
	ESE3	0.869***	1.617			
	ESE4	0.803***	2.679			
	ESE5	0.788***	2.893			
	ESE6	0.818***	2.052			
<i>Organizational citizenship behavior toward the environment (OCBE)</i>				0.936	0.968	0.755
Eco-civic engagement	OCBE1	0.780***	1.665	0.835	0.89	0.671
	OCBE2	0.752***	1.533			
	OCBE3	0.896***	2.729			
	OCBE4	0.841***	2.252			
Eco-initiatives	OCBE5	0.933***	2.919	0.894	0.934	0.826
	OCBE6	0.867***	2.125			
	OCBE7	0.925***	2.325			
Eco-helping	OCBE8	0.898***	2.229	0.872	0.921	0.795
	OCBE9	0.901***	2.564			
	OCBE10	0.877***	2.243			

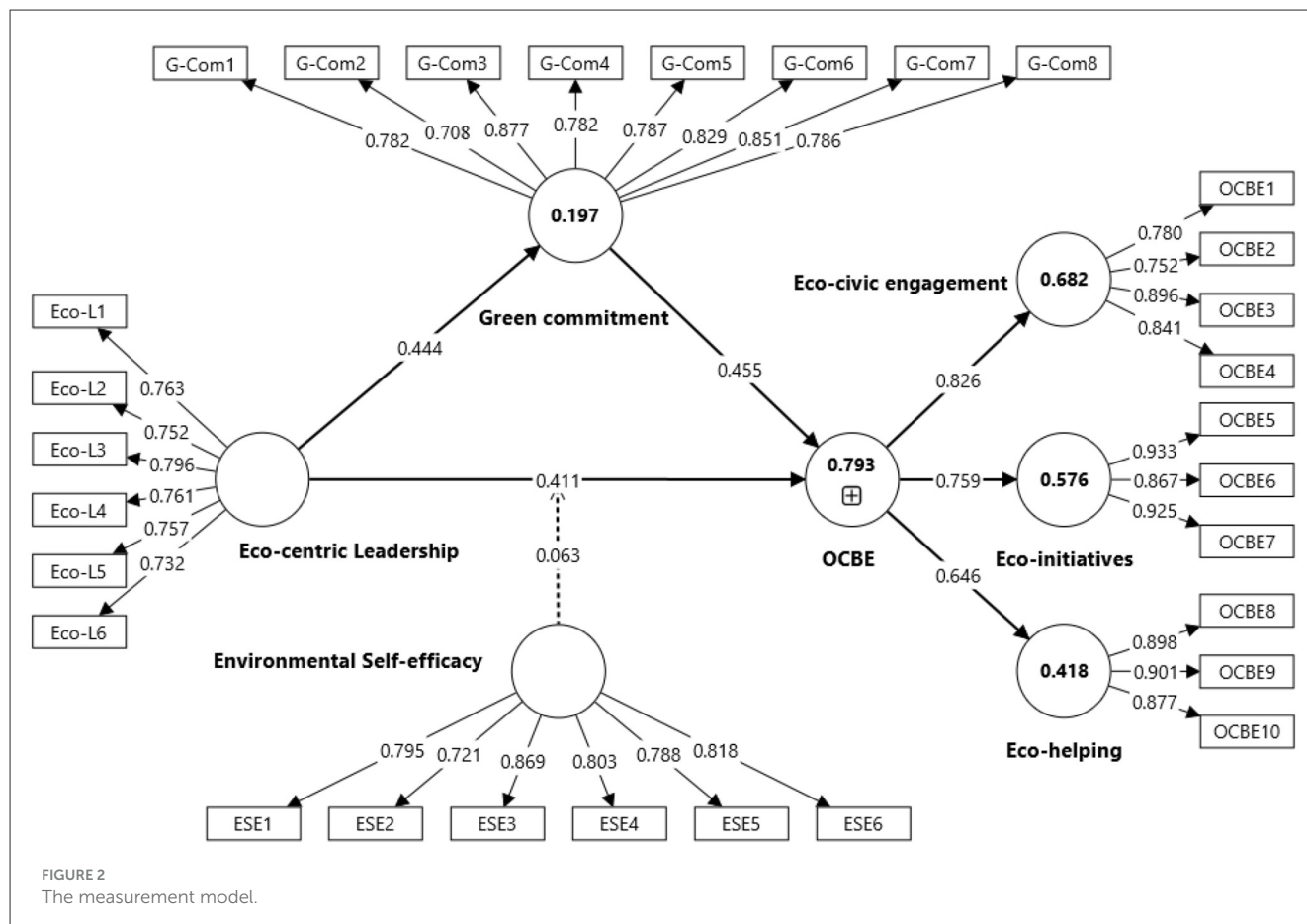
*** $p < 0.001$.

all item loadings significantly exceeded the recommended 0.708 threshold, as outlined by Hair et al. (2019). Moreover, composite reliability (CR) values, reflecting how well the indicators measure the latent construct, were above 0.70, confirming their adequacy. The results in Table 2 further indicate that all rho_c values for latent variables exceeded 0.70, ranging from 0.892 for Eco-L to 0.968 for OCBE.

Similarly, Cronbach's alpha, assessed using the same 0.70 threshold, showed values between 0.854 (Eco-L) and 0.936 (OCBE),

confirming good internal consistency reliability across the study variables. Additionally, the AVE values reflect the extent to which the latent construct's indicators capture variance, surpassing the 0.50 benchmark, ranging from 0.578 (Eco-L) to 0.755 (OCBE). These results strongly confirm that the measurement items used in this study show good convergent validity. The findings indicate that the items accurately reflect the intended constructs.

Further, Variance Inflation Factors (VIF) were utilized in this study to determine if multicollinearity problems existed.



A threshold of three is typically used, where values above this level indicate concerns (Hair et al., 2019). The results in Table 2 confirm that all constructs' items have VIF values below this limit, demonstrating that multicollinearity is not problematic and that the model remains robust.

Following the evaluation of the CV, discriminant validity (DV) was evaluated through the approach of Henseler et al. (2015). According to this approach, the heterotrait-monotrait (HTMT) ratio was utilized to evaluate DV, with a recommended threshold of 0.90. However, DV concerns arise when HTMT values exceed 0.90. The findings in Table 3 confirm that DV is not an issue in this study, as all HTMT values remain below the 0.90 threshold, affirming that discriminant validity is properly established.

4.2 Structural model assessment and hypotheses testing

After assessing the measurement model, the next step in PLS-SEM is evaluating the structural model. This process involves examining the coefficient of determination (R^2), the significance and relevance of path coefficients, and the model's predictive relevance using the Q^2 predict procedure. First, the R^2 value, also known as in-sample predictive power (Rigdon, 2012), was calculated. As shown in Figure 3, the R^2 value for the combined

effects of Eco-L, G-Com (mediator), and environmental self-efficacy (moderator) on OCBE is 0.793. This means the model explains 79.3% of the variance in OCBE. In other words, almost four-fifths of the variations in OCBE are influenced by these predictors. This indicates a high level of predictive power for the structural model (Hair et al., 2019). Further, in terms of the R^2 value for the effect of Eco-L on employees' G-Com, the results revealed that the model explained 19.7% of the variance in G-Com. Although the R^2 value for Green Commitment (0.197) is slightly below the often-cited threshold of 0.20, it remains acceptable within the context of behavioral and social sciences research (Hair et al., 2019). Moreover, to ensure robustness and address potential endogeneity concerns, a Gaussian copula test (Park and Gupta, 2012) was conducted for the relationship between Eco-centric Leadership and Green Commitment. The results showed a non-significant coefficient ($t = 1.766$, $p = 0.078$), indicating that endogeneity is not present. This finding confirms that the path estimates obtained from PLS-SEM are reliable and not biased by endogeneity, which further supports the credibility of the results despite the modest R^2 .

Secondly, the Q^2 predict statistic was used to evaluate the model's predictive relevance for the endogenous constructs. This measure is a key part of the PLSpredict procedure. A Q^2 predict value greater than zero means the model has predictive relevance. It shows the model performs better than a simple average-based prediction of the dependent variable (Hair et al., 2019). As shown

TABLE 3 Discriminant validity.

Construct	Eco-L	G-Com	OCBE	ESE	ESE x Eco-L
Eco-centric Leadership (Eco-L)					
Green Commitment (G-Com)	0.498				
OCBE	0.705	0.778			
Environmental Self-efficacy (ESE)	0.505	0.740	0.722		
ESE x Eco-L	0.468	0.339	0.348	0.353	

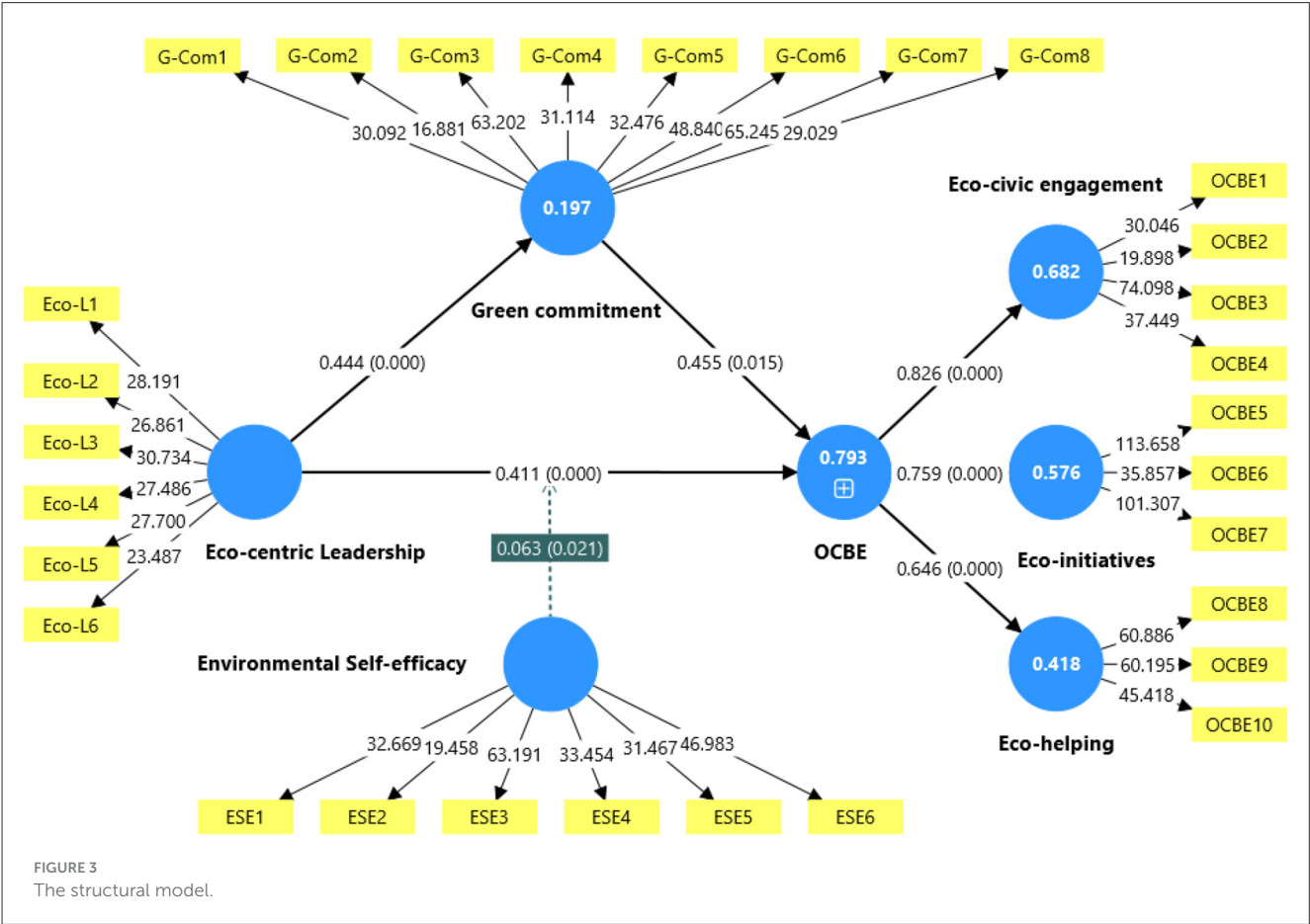


TABLE 4 Analysis of R^2 value and Q^2 predict values.

Construct	R^2	Q^2 predict
Green Commitment	0.197	0.190
OCBE	0.793	0.617

in Table 4, the Q^2 predict values for both constructs were positive (G-Com = 0.190; OCBE = 0.617). This confirms that the structural model has strong predictive relevance.

Thirdly, a bootstrapping approach with 5,000 sub-samples was used to test the study's hypotheses and evaluate the statistical significance of path coefficients. A coefficient was considered significant if the p-value was below 0.05 and the t-value exceeded 1.96.

As shown in Table 5, the analysis revealed several significant findings. First, Eco-L positively influences OCBE ($\beta = 0.411$, $t = 8.460$, $p < 0.001$), supporting H1. This means that higher Eco-L levels are strongly associated with OCBE. Second, there is a significant positive relationship between Eco-L and G-Com ($\beta = 0.444$, $t = 9.490$, $p < 0.001$), confirming H2. This suggests that higher Eco-L levels increase employees' G-Com. Third, the link between G-Com and OCBE was also significant ($\beta = 0.455$, $t = 2.434$, $p < 0.05$), supporting H3. This shows that G-Com plays a vital role in enhancing employees' OCBE.

Fourth, the mediation analysis examined how G-Com mediates the relationship between Eco-L and OCBE. The results in Table 4 ($\beta = 0.202$, $t = 2.297$, $p < 0.05$) confirm that G-Com acts as a significant mediator, supporting H4. However, the direct effect of Eco-L on OCBE is still significant even when G-Com is included as a mediator. This indicates partial mediation. In other words, while

TABLE 5 Structural parameter estimates.

Hypothesized path	Path coefficient	Standard deviation (STDEV)	T Statistics	P value	Confidence intervals		Results
					2.5%	97.5%	
Direct effect							
Eco-L -> OCBE	0.411	0.049	8.460***	0.000	0.313	0.504	Accepted
Eco-L -> G-Com	0.444	0.047	9.490***	0.000	0.352	0.537	Accepted
G-Com -> OCBE	0.455	0.187	2.434*	0.015	0.081	0.809	Accepted
Mediating effect							
Eco-L -> G-Com -> OCBE	0.202	0.088	2.297*	0.022	0.035	0.378	Accepted
Moderating effect							
ESE x Eco-L -> OCBE	0.063	0.027	2.314*	0.021	0.008	0.114	Accepted
Total effect							
Eco-L -> OCBE	0.613	0.610	0.101***	6.084	0.420	0.813	Accepted

*** $p < 0.001$, * $p < 0.05$.

G-Com helps explain the relationship between Eco-L and OCBE, Eco-L still directly influences OCBE (Zhao et al., 2010).

In addition to reporting path coefficients and t-statistics, we compared the direct and indirect effects of Eco-L on OCBE and calculated the Variance Accounted For (VAF). As shown in Table 4, the direct effect Eco-L \rightarrow OCBE is $\beta = 0.411$ (STDEV = 0.049; $t = 8.460$; $p < 0.001$; 95% CI [0.313, 0.504]) and the indirect effect via G-Com is $\beta = 0.202$ (STDEV = 0.088; $t = 2.297$; $p = 0.022$; 95% CI [0.035, 0.378]). The total effect of Eco-L on OCBE is therefore $\beta = 0.613$, yielding VAF = $0.202/0.613 = 0.330$. Following common guidelines (e.g., Hair et al., 2019), a VAF around 0.33 indicates partial mediation—consistent with the finding that both the direct and indirect paths are significant (Zhao et al., 2010). We also report percentile bootstrap 95% confidence intervals for the indirect path, which excludes zero, further confirming the presence of a significant mediating effect.

Fifth, the analysis examined how ESE influences the relationship between Eco-L and OCBE. The results in Table 5 and Figure 4 show that ESE acts as a moderator, making the positive relationship between Eco-L and OCBE stronger ($\beta = 0.063$, $t = 2.314$, $p < 0.05$). This finding supports Hypothesis 5. It suggests that while Eco-L generally boosts OCBE, this effect is even stronger for employees with higher levels of environmental self-efficacy.

5 Discussion

Grounded in the principles of SET and SCT, this study intended to examine a newly developed proposed framework by exploring the influence of Eco-L on employees' G-Com and OCBE. Furthermore, it explored the predictive role of G-Com in shaping OCBE. Additionally, this study looked into G-Com's mediation effect and ESE's moderation role within this framework. The findings from this study reveal critical insights regarding the linkage between Eco-L and employees' engagement in PEBs within the hospitality context in Saudi Arabia.

Firstly, our analysis demonstrates that Eco-L significantly impacts OCBE, affirming H1. This finding is consistent with the growing literature highlighting the important role of eco-leadership in promoting employees' voluntary environmental initiatives (Hasan et al., 2024; Zafar et al., 2023; Abdou et al., 2023). Prior researchers suggest that when leaders exhibit strong ecological values and actively promote sustainability, employees demonstrate a higher likelihood of internalizing these principles and engaging in discretionary behaviors that benefit the company's efforts to enhance ecological sustainability (Biswas et al., 2022; Uddin et al., 2021). Further, this aligns with the principles of the SET, as employees may reciprocate their leaders' environmentally responsible behaviors by engaging in OCBE (Abdou et al., 2023; Abdou, 2025).

Secondly, this research also established that Eco-L has a significant positive impact on employees' G-Com (H2), indicating that a higher level of Eco-L is more likely to enhance employees' dedication to environmental sustainability within the hotels investigated. This evidence supports existing research and reinforces the conclusions of several scholars who have emphasized that leaders dedicated to promoting environmental values and integrating sustainable practices into their leadership approach can effectively cultivate a strong sense of G-Com among their employees (Orgun et al., 2024; Yang and Zhang, 2023; Ojo and Fauzi, 2020; Ye et al., 2023). Moreover, this result suggests that when leaders actively promote ecological responsibility, employees develop a greater sense of identification with their organization's eco-conscious objectives, increasing their willingness to engage in environmentally responsible behaviors. This supports the argument that leadership contributes significantly to shaping employees' PEB and fostering a long-term commitment to green initiatives (Orgun et al., 2024; Yang and Zhang, 2023).

Regarding the relationship between employees' G-Com and OCBE, the results obtained from PLS-SEM confirm that G-Com exerts a substantial positive impact on OCBE (H3). This finding is consistent with previous studies. It shows that G-Com plays a vital role in influencing employees' OCBE. When employees are strongly committed to their organization's environmental goals, they are



FIGURE 4
The moderation effect of ESE on the link between Eco-L and OCBE.

more likely to engage in voluntary PEB that go beyond their regular job duties (Memon et al., 2022; Noor Faezah et al., 2024; Ren et al., 2023; Saifulina et al., 2021).

Fourthly, the findings from the mediation analysis provide empirical evidence that G-Com acts as a significant partial mediator in the linkage between Eco-L and OCBE (H4). This suggests that when employees perceive their leaders to be eco-friendly/environmentally focused, they develop a stronger commitment to sustainability, which subsequently motivates them to engage in voluntary PEB (e.g., OCBE). More specifically, from a theoretical standpoint, these findings align with the SET (Blau, 1968), which suggests that when individuals receive encouragement and guidance from their managers, they tend to reciprocate with positive actions. In the context of Eco-L, this means that when leaders prioritize sustainability and demonstrate strong environmental values, employees naturally feel a sense of responsibility toward these initiatives (Hameed et al., 2022; Orgun et al., 2024). Over time, they internalize environmentally focused values and merge them into their everyday work behaviors, making sustainability a fundamental part of the workplace culture rather than just a corporate expectation.

Lastly, the findings of this research present empirical evidence that ESE plays a crucial role in strengthening the impact of Eco-L on OCBE. This suggests that while Eco-L positively influences OCBE, its effect is much stronger among employees with higher ESE. This could be attributed to the fact that employees with high ESE are more confident in their ability to take meaningful action, knowing their efforts will make a difference. Consequently, they are more apt to respond positively to Eco-L and engage in environmentally friendly behaviors. On the other hand, employees with low ESE may lack the confidence to take the initiative in sustainability efforts, even when encouraged by eco-centric leaders. This finding supports

SCT and the earlier conclusions by Faraz et al. (2021) within the energy sector context, highlighting GSE/ESE as a key factor that strengthens the linkage between green leadership and EPB.

6 Implications of the study

6.1 Theoretical implications

From a theoretical perspective, this study makes several contributions to the literature on eco-centric leadership (Eco-L) and employees' pro-environmental behaviors (EPB) in the hospitality sector. First, the study proposes and empirically validates a novel integrative framework that links Eco-L to organizational citizenship behavior for the environment (OCBE), with green commitment (G-Com) as a mediating mechanism and environmental self-efficacy (ESE) as a moderating factor. By drawing on Social Exchange Theory (SET) and Social Cognitive Theory (SCT), the framework explains not only whether but also how and when leadership shapes employees' voluntary pro-environmental actions. This dual-theoretical approach enables a richer explanation of leadership's influence on sustainability-oriented behavior, particularly in the underexplored context of eco-friendly hotels. Second, the findings extend SET by illustrating that Eco-L fosters OCBE through a reciprocal exchange process, in which employees interpret eco-centric leadership as a form of organizational support for environmental sustainability. This perceived support encourages employees to "give back" through discretionary environmental behaviors beyond their formal job descriptions. Moreover, G-Com emerges as a key psychological mechanism that strengthens this exchange relationship: when

employees internalize sustainability values, their commitment translates into more consistent and proactive OCBE.

Third, the study advances SCT by identifying ESE as a boundary condition that strengthens the Eco-L–OCBE relationship. Employees with high ESE are more likely to translate leadership cues into tangible environmental behaviors because they believe in their capacity to make a difference. This aligns with SCT's assertion that individuals' self-beliefs shape their interpretation of environmental signals and subsequent actions. The results thus highlight the interactive influence of leadership and psychological resources in fostering sustainable work practices. Fourth, in the context of green hospitality, this is one of the first empirical investigations to assess ESE's moderating role within the Eco-L literature. This addresses a recognized research gap and responds to recent scholarly calls (e.g., Hasan et al., 2024; Zafar et al., 2023; Faraz et al., 2021) to explore personal, organizational, and psychological resources as boundary conditions in leadership–sustainability dynamics across different cultural and industry settings.

6.2 Practical implications

This research offers practical insights for hospitality organizations, particularly eco-friendly hotels, by highlighting the role of Eco-L, G-Com, and ESE in fostering employees' OCBE. First, hotel management should prioritize eco-centric leadership development programs to foster sustainable workplace behaviors. This can be achieved by integrating sustainability training into leadership development initiatives and embedding eco-centric values into organizational policies and decision-making processes.

Second, since G-Com was found to significantly mediate the Eco-L–OCBE relationship, organizations should strengthen employees' psychological commitment to sustainability. This can be achieved by aligning corporate ecological goals with employees' personal values, involving staff in setting environmental targets, recognizing contributions to green initiatives, and creating opportunities for employees to propose innovative sustainability solutions. These steps help translate leadership influence into lasting employee commitment, which in turn drives OCBE.

Third, our findings reveal that ESE moderates the Eco-L–OCBE link, meaning that Eco-L is more effective for employees who feel confident in their environmental abilities. Therefore, training programs should go beyond general sustainability awareness and instead target skill development and confidence-building. Examples include hands-on workshops for waste reduction or energy-saving techniques, mentorship programs where experienced “green champions” guide others, and regular feedback sessions that reinforce employees' belief in their ability to make a meaningful environmental impact.

Fourth, developing policies that support voluntary PEB is also essential. Hotel management should integrate formal policies that empower employees to take action in voluntary sustainability initiatives beyond their required job duties. This can be realized by creating green teams or sustainability committees within the organization, encouraging employees to participate in sustainability initiatives, and implementing sustainability incentive

programs, such as rewards for employees who take the lead in green initiatives.

7 Limitations and future research directions

Acknowledging study limitations helps refine future research directions. While this research has significant theoretical and practical values, some limitations should be considered. First, the cross-sectional research design restricts the study's capacity to determine the causal linkage between the examined variables. A longitudinal study would more effectively capture the cause-and-effect dynamics of Eco-L, G-Com, ESE, and employees' OCBE. Future researchers may explore longitudinal or experimental approaches to enhance causal inference in these relationships. Second, the generalizability of findings requires careful consideration. This study focused on hospitality employees in Saudi Arabia, which could reduce the relevance of the results to broader sectors and cultural contexts. Research in the future should expand the investigation into different industries, such as banking, healthcare, manufacturing, and retail, to verify and broaden these findings in diverse workplace settings. Additionally, cross-cultural studies could provide a comparative perspective on how Eco-L influences employee sustainability behaviors in different regions.

Third, we recognize that using non-probability sampling (e.g., convenience sampling) and focusing only on gold-rated eco-certified hotels may limit how far our findings can be generalized. While this approach helped ensure that all participating hotels had consistent and advanced sustainability practices, it also meant that hotels with lower certification levels or those without eco-certification were not included. As a result, the findings might not fully capture the diversity of practices and experiences in the wider Saudi hospitality sector or other cultural settings. Future studies could broaden the scope by including hotels from different rating levels and using random or stratified sampling methods to provide a more representative overview and strengthen the external validity of the results.

Fourth, this study only considered green commitment (G-Com) as an intervening variable. While G-Com is crucial, future research may incorporate additional mediators at different levels, such as green psychological capital, green intellectual capital, green empowerment, and green organizational climate. Examining these mediating factors could offer deeper insights into the mechanisms that link leadership and EPB. Fifth, this research incorporated ESE as a moderating variable. While ESE significantly shaped the relationship between Eco-L and OCBE, future studies may explore alternative moderators that could influence this relationship. Potential moderators may include green identity, green mindfulness, green altruism, workplace environmental norms, and green HRM practices.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Research Ethics Committee—King Faisal University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

AHA: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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