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Managerial green leadership behavior and its impact on employee environmental citizenship behavior: the mediating role of green intellectual capital in the hospitality sector

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ABSTRACT

Hospitality organisations are crucial in driving green and sustainable business practices as the world advances toward global decarbonisation. This study investigates the relationship between Green Leadership Behavior (GLB) and employee Environmental Citizenship Behavior (ECB), focusing on the mediating role of three facets of Green Intellectual Capital (GIC), i.e. Green Human Capital (GHC), Green Structural Capital (GSC) and Green Relational Capital (GRC). The study is based on a multilevel dataset comprising 264 employees (Level 1) nested within 16 hospitality organisations (Level 2). We used a 2-1-1 multilevel mediation model to analyse the data, using Jamovi 2.5 software. We found that GHC, GSC, and GRC serve as a mechanism through which GLB is associated with increased ECB. The study recommends valuable insights for hospitality organisations to provide the necessary and timely availability of intangible assets such as GHC, GSC, and GRC so that GLB may effectively exploit GIC to encourage ECB. We contribute to the leadership literature in tourism and hospitality by identifying key pathways through which GLB influences ECB, emphasising the crucial role of GIC in shaping employees' environmentally friendly behaviors.

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Introduction

As global efforts toward decarbonisation intensify, the role of tourism and hospitality organisations—and their leadership behavior—has become increasingly critical in driving the adoption of green and sustainable behaviors (Bhutto et al., 2021). These

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organisations are expected to implement eco-conserving actions within their operations and to set industry-wide standards that contribute to broader environmental goals (Meirun et al., 2024). In recent years, the hospitality industry has begun to actively promote and incorporate green behaviors, with a particular focus on promoting Environmental Citizenship Behavior (ECB) (Soomro & Soomro, 2024). Employee ECB, at the individual level, involves responsible pro-environmental behavior by individuals who actively engage as change-makers (Raineri & Paillé, 2016). In the tourism and hospitality sector, such behavior is crucial not only for achieving environmental sustainability but also regarded as a critical engine of economic expansion (Yin et al., 2021).

Given the growing emphasis on enhancing employee ECB within the tourism and hospitality sector, organisations are increasingly exploring various leadership actions to encourage this behavior (Aboramadan & Karatepe, 2021; Khan et al., 2023). Recent trends highlight leadership activities that prioritise environmental sustainability, including responsible leadership (Ismail & Hilal, 2023), green transformational leadership (Cui & Yu, 2021), green, inclusive leadership (Aboramadan et al., 2022) and spiritual leadership (Usman et al., 2021) (see Table 1). These leadership frameworks share a common commitment to internal and external stakeholders, emphasising citizenship behaviors and integrating environmental and sustainability priorities into organisational activities. Effective environmental leadership behaviors involve focusing on internal matters such as resource management, waste, and efficiency and adopting an external perspective that considers and addresses factors that safeguard the rights and safety of surrounding communities (Hassan et al., 2018). In this study, we investigate Green Leadership Behavior (GLB) as enacted by direct managers who are particularly close to frontline employees and involved in their daily activities (Khan et al., 2023). GLB is a set of behaviors that prioritise environmental sustainability, such as encouraging eco-friendly innovations, communicating the importance of ecological protection, providing training and coaching on environmental issues and openly acknowledging green initiatives and ideas (Li et al., 2020; Xing & Starik, 2017). GLB by direct managers demonstrates a strong commitment to environmental concerns (Arici & Uysal, 2022). While research on GLB is still emerging (Asante, 2024), findings suggest that it has significant potential to drive prosocial behaviors in organisations (Çop et al., 2021).

To deepen our investigation into the consequences of GLB on employee ECB, we draw on signaling theory to examine how messages conveyed by direct managers regarding green and sustainability practices in tourism and hospitality organisations influence employee ECB. Green behaviors acknowledge the essential nature of environmental well-being, promoting resource conservation and supporting nature protection. Previous research has argued that the relationship between green leadership and employee environmental behavior (e.g. environmental citizenship behavior) is neither straightforward nor purely causal, suggesting the influence of intermediate factors (Nawaz Khan, 2023). Although past research has explored several mediating mechanisms to uncover how green leadership affects employee environmental behavior—such as green attitudes (Khan et al., 2023), perceived green organisational support (Aboramadan et al., 2022), and organisational green learning (Cui & Yu, 2021), there remains a need to examine additional mechanisms. For instance, Hasan et al. (2024)

Table 1. Studies on pro-environmental leadership and behaviors.

Authors	Method	Theory	Antecedents	Mediators	Outcomes	Context	Participants
(Hasan et al., 2024)	Survey	Theory of planned behavior	Eco-centric leadership	Green Climate: Green knowledge sharing, Value congruence,	Pro-environmental behaviors	Hospitals	251
(Asante, 2024)	Survey	Person-organization fit, Norm activation	Green leadership	Moral consciousness	Pro-environmental behavior	Hotels	235
(Meirun et al., 2024)	Multi-wave	Conservation of resources, RBV	Environmentally specific empowering leadership	Employee green learning orientation, green creative self-efficacy	Employees' green creativity	Hotels	333
(Janjua et al., 2024)	Time-lagged survey	Natural resource-based view	Green transformational leadership	Green dynamic capability, Green environmental orientation	Green innovation	Hotels	347
(Olorunsola et al., 2024)	Time-lagged Survey	Social learning, Social Cognitive, Organizational support	Green supervisor support	Green self-efficacy, green creativity	Green task performance	Hotels	402
(Tabrizi et al., 2023)	Survey	Social exchange, attribution theory Social learning	Green human resource management	Job embeddedness	Green promotive or prohibitive voice behavior,	Restaurants	130
(Farrukh et al., 2023)	Survey	Social learning	Environmentally specific authentic leadership	Team environment goal clarity	Team Green creative behavior	Hotels	545
(Karatepe et al., 2022)	Survey	Social exchange, Job demands-resources, Stakeholder	Management commitment to the ecological environment	Green work engagement	Pro-environmental behavior	Hotels	179
(Dang & Wang, 2022)	Time-lagged survey	Leadership	Green Innovation strategic orientation	Green Intellectual Capital	Competitive advantage	Restaurant and hotels	264
(Tosun et al., 2022)	Survey	Social exchange	Green transformational leadership, Green inclusive leadership	Corporate social responsibility	Green performance of employees	Restaurants	292
(Aboramadan et al., 2022)	Survey	Self-determination	Green, inclusive leadership	Green organisational support	Employees' green behaviors	Hotels	436
(Kim et al., 2020)	Survey	–	Environmental transformational leadership	Environmental belief	Organisational citizenship behavior toward the environment	Hotels	385
Current study	Multi-level	Signaling and conservation of resources	Green leadership behavior	GHC, GSC, GRC	Environmental citizenship behavior	Hotels	264

have called for further investigation into the processes through which green leadership behavior impacts employee environmental behavior. Addressing this gap, this study introduces a novel approach by investigating a multilevel mediation model in which perceived Green Human Capital (GHC), Green Structural Capital (GSC), and Green Relational Capital (GRC)—three key constructs of Green Intellectual Capital (GIC) (Chen, 2007)—serve as critical links between GLB and ECB. This mediation mechanism has not yet been explored. Thus, this research endeavors to explore the ensuing question: What role do GHC, GSC, and GRC play in linking GLB to employee ECB? To investigate this, we performed data collection with the frontline workforce in hospitality organisations in the Turkish Republic of Northern Cyprus (TRNC).

We make the following contributions. First, we integrate signaling theory into the GLB and employee ECB literature. This provides a new perspective on how perceived sustainable leadership behavior inspires employees from their interactions with direct supervisors (Karasek III & Bryant, 2012). We argue that the signal transmission between the direct manager-employee interaction addresses information ambiguities and asymmetries regarding the importance of ECB within an organisation. These signals are subsequently translated into employees' perceptions within the organisation, mainly due to its focus on environmental sustainability, which stimulates employee ECB. Second, we advance our understanding of the mechanisms that link GLB to employee ECB by investigating how this relationship unfolds. We contribute to the literature by exploring three novel mediators: employee perceptions of GHC, GSC, and GRC. To theorise the impact of these mediators, we leverage the Conservation of Resources (Zacher et al.) theory, which introduces the concept of resource distribution pathways and personal resources (Hobfoll et al., 2018). The limited focus has been on employee cognitive processes as antecedents of employee ECB. GIC, which encompasses the knowledge, skills and abilities related to environmental management, emphasises the alignment between employees and the organisation (Chang & Birkett, 2004). It is a vital resource (Jiang et al., 2024), the literature reveals that perceived GIC, as part of a resource caravan, enable employees to leverage personal resources in the form of green behavior, which subsequently translates into employee ECB. Lastly, past studies (e.g. Nawaz Khan, 2023) emphasised the need to investigate how green leadership affects employee green behavior in diverse cultural and industrial contexts. Motivated by this call, our research examines the impact of GLB on the ECB in the hospitality sector of the TRNC. This underexplored context presents a unique opportunity to validate and extend prior findings, while contributing to the growing body of literature on sustainability practices in emerging economies.

Theoretical model and hypotheses

Signalling theory explains how leaders transmit signals that front-line personnel perceive and interpret to foster mutual understanding (Boulamatsi et al., 2024; Spence, 2002). Leaders send noticeable actions that convey information about their values and intentions to employees. In tourism and hospitality organisations, eco-friendly and sustainable initiatives indicate a commitment to green productivity. For example, implementing energy-efficient lighting and renewable energy sources are practical measures hotels adopt to demonstrate their dedication to sustainability efforts (Monge,

2024). These signals help front-line employees comprehend their leaders' vision and act appropriately to contribute to an eco-friendly and sustainable environment (Johannsdottir et al., 2015). This effectiveness stems from the proximity between managers and employees (Ogunfowora et al., 2023). For a signal to be effective, it must be observable and interpretable by the receiver, allowing them to understand the message being conveyed accurately. Research shows that eco-friendly behaviors reflected in leadership significantly shape employees' behaviors, influenced by their perceptions of the leaders (Friske et al., 2023). Thus, Signaling theory is notably relevant within the scope of manager-subordinate relationships, as it acts as the primary source of explicit and implicit signals to reduce information asymmetries and provide clarity within these dyadic interactions (Boulamatsi et al., 2024; Friske et al., 2023).

The study also applies the COR theory, which maintains that individuals are more inclined to display positive behaviors with ample access to resources (Poetz & Volmer, 2024; Ren et al., 2024). Resources are both tangible and intangible assets that individuals consider valuable for attaining their objectives. The theory proposes that individuals actively strive to attain, preserve, nurture, and safeguard these valuable resources (Halbesleben et al., 2014). Within the framework of COR theory, GIC represents a contextual resource that facilitates the transfer of resources generated by GLB to influence the prosocial behavior of employees, such as ECB.

Green leadership behavior and environmental citizenship behavior

Zacher et al. (2024) define GLB as an eco-motivated behavior that incorporates environmental excellence into all steps of internal operations, products, services, and community support. Asante (2024) discusses three essential characteristics of green leaders: the ability to adapt to change, a commitment to self-improvement, and a strong inclination towards ethical and eco-friendly behavior. Tran et al. (2023) suggest that GLB is proactive in taking the initiative and managing changes in a fashion that upholds sustainability. This approach allows green leaders to evaluate current policies and motivates employees to adapt to changes that foster a sustainable environment (Yuriev et al., 2018). By implementing sustainable practices, GLB actively addresses climate change concerns (Rubel et al., 2023). GLB also cultivate environmental citizenship, which involves responsible, climate-friendly actions where individuals act as agents of change (Farrukh et al., 2023). According to the Signaling perspective, GLB inspires followers to achieve environmental excellence by formulating and executing eco-friendly initiatives.

Research shows that GLB significantly influences employees' eco-conscious behaviors (Ahmed et al., 2024). Employees exhibit a higher propensity to adopt prosocial behavior when they receive support from their leaders (Aboramadan & Karatepe, 2021; Bouzari et al., 2022). It drives employee sustainable behaviors by fostering internal motivation and positive emotional states (Robertson & Barling, 2017). Expressly, green leaders set an example within organisations by promoting a work environment that prioritises environmental care (Gutierrez-Broncano et al., 2024). They exert an idealised influence by advocating for and practising environmental protection, creating a role model effect that encourages behaviors aligned with the organisations' environmental vision (Robertson & Barling, 2017). According to Paillé and Meija-Morelos (2019), GLB

is key to balancing environmental preservation with economic goals. Based on the above discussion, this study posits that GLB signals employees regarding the organisation's dedication to green and environmental matters, thereby affecting employees' conduct and integrating green practices. Therefore, signals from the direct manager indicating that the organisation prioritises the environment and that executives personally value green problems will generate favourable impressions that the employee aligns with the organization (Al-Swidi et al., 2021). These signals transmit crucial information to frontline employees and help encourage employees to report engaging in ECB. Thus, stated formally:

H1: GLB positively relates to the ECB

The mediating role of GHC

According to Chen (2007), GIC refers to the intangible assets of an organisation, such as knowledge, wisdom, talents, experience, and innovation, related to environmental preservation. Researchers have suggested three aspects of GIC: GHC, GSC, and GRC. (Del Gesso et al., 2024; Shahbaz et al., 2024; Yong et al., 2019). GHC refers to the qualities of individuals, such as their expertise, technical skills, knowledge, and education (Ahakwa & Tackie, 2024). While GSC "encompasses the non-human aspects of information within a company, such as documentation, systems, implementation procedures, strategies, and intangible resources" (Jiang et al., 2024). Corporations have become more aware of integrating sustainability knowledge into their employees to promote green behaviors and respond to external environmental concerns (Del Gesso et al., 2024). Given the current concerns surrounding environmental challenges, many firms strongly emphasise developing sustainability expertise and fostering a culture that prioritises it (Dang & Wang, 2022). This is to ensure that they can create and implement innovative approaches that are environmentally focused and leverage opportunities to establish a competitive edge in the market (Dang & Wang, 2022). Lastly, GRC is the value a firm gains from its relationships and connections with different stakeholders (Shahbaz et al., 2024). The business's principal stakeholders and external bodies contribute strategic assets and many types of collaboration that facilitate the growth and sustainability of an organization (Al-Swidi et al., 2021). Companies, as do their stakeholders and other external entities, prioritise environmental awareness. Companies are realising the importance of the growing environmental movement and are looking to allocate more resources to develop partnerships with others who share their environmental concerns (Soomro & Soomro, 2024).

GLB and GHC are essential for organisations aiming to achieve sustainability (Agyabeng-Mensah et al., 2023). Several studies stress the pivotal role of leaders as an intermediary process in implementing the practices advocated by HRM to enhance employee engagement and performance (Berniak-Woźny, 2023; Liu et al., 2024; Poetz and Volmer 2024; Luu, 2024; Nishii & Paluch, 2018; Thanh and Tran 2023). Literature suggests that the interaction effect of HRM practices and leadership generates positive behavioral outcomes (Javed et al., 2020; Nguyen et al., 2022; Zhang et al., 2021). In

another stream of literature, leadership is seen as an antecedent that influences HRM practices, resulting in sustainable performance (Berniak-Woźny & Rataj, 2023; Kim et al., 2020; Ogunfowora et al., 2023; Tosun et al., 2022; Zacher et al., 2024). Leveraging the signaling and COR theory, this study asserts that leadership is pertinent in advancing GHC and protecting the environment. The study further suggests that GLB is likely to affect GHC, which then influences employee behavior, leading to the display of prosocial behaviors such as ECB. Thus, proposed formally:

H2: GHC mediates the relationship between GLB and ECB

The mediating role of GSC

Cabral and Chiappetta Jabbour (2020) believe that success in today's business climate relies on rapidly adjusting to evolving market conditions and anticipating future challenges (Ahmed et al., 2024; Bouzari et al., 2022; Luu, 2024). GSC enables companies to continuously and successfully adapt and perform in a dynamic market by introducing green systems and procedures (Beltramino et al., 2020). It can rejuvenate the organisational strength to survive in a dynamic environment, providing leverage to promptly respond to evolving uncertainties in a turbulent situation by upgrading procedures, systems, and policies to the highest standards of the modern era.

Organisations may introduce novel strategies to discover and seize new market opportunities, which impact their continuous commitment to eco-responsible practices (Ahmed et al., 2024). GSC can foster environmental conservation efforts by elevating managerial competencies and functional efficiency through the reinforcement of administrative systems, policy structures, and procedural frameworks. The role of an organization's proactive strategic foresight in eco-friendly policies encourages stakeholder engagement in endeavors outside employees' core obligations and stimulates a commitment to civic principles, thereby inspiring them to demonstrate altruistic behaviors (Nawaz Khan, 2023). Scholars contend that GLB is essential in developing organizational stewardship concerning its social, ecological, and economic facets (Hasan et al., 2024; Poetz & Volmer, 2024; Thanh & Tran, 2023). This is facilitated by the spreading of comprehensive knowledge and professional expertise, along with the execution of knowledge-driven strategic decisions (Al-Swidi et al., 2021; Asante, 2024; Berniak-Woźny & Rataj, 2023). Thus, our study proposes that GSC may act as a potential mechanism through which the influence of GLB is expected to promote voluntary and extra-role behavior (ECB) among employees. Thus, stated formally:

H3: GSC mediates the relationship between GLB and ECB

The mediating role of GRC

GRC is based on the notion of firm connections with stakeholders who understand and hold the necessary environmental knowledge and expertise to promote ecological balance (Wu et al., 2022). Nisar et al. (2021) highlight the value and implications of sustainable awareness programs to help stakeholders and communities

develop eco-centric policies and procedures. According to signaling and COR theory, the role of GLB becomes indispensable at the top as it can enhance employees' proficiency in environmental issues and enables them to integrate many areas of the organisation connected to environmental conservation (Yu & Huo, 2019). Hasan et al. (2024) argue that eco-centric policies formulated by the top management are crucial in cultivating competencies, including green knowledge and skills among stakeholders. This, in turn, will likely facilitate the development of eco-conscious behavior and contribute to achieving environmental performance (Olorunsola et al., 2024). Furthermore, GLB is likely to offer green capabilities that encompass energy saving, waste reduction, environmental awareness, and problem-solving and ultimately contribute to enhancing a corporation's ecological impact through ECB (see Figure 1). Thus, proposed formally:

H4: GRC mediates the relationship between GLB and ECB

Methods

Study context

Tourism is a cornerstone of the TRNC economy and contributes significantly to employment and foreign exchange earnings. In 2023, net tourism income reached 1,182.1 million USD, covering 45.1% of the trade deficit, while the accommodation sector, consisting of approximately 170 hotels with a total bed capacity of 27,404 (including 24 5-star hotels with 16,886 beds and 5 4-star hotels with 1,718 beds), plays a key role in the sector (Tourism Planning Department, 2023). The number of tourism employees reached 11,963, excluding those working in tourism and travel agencies and casinos (Tourism Planning Department, 2023). The TRNC faces various environmental challenges, including unsustainable and ecologically harmful practices, air and water pollution, inadequate waste governance approaches, and climate change concerns that disrupt the environmental equilibrium and tourism appeal. This research focuses on the TRNC hotel and tourism industry so that the industry adopts pro-environmental activities to achieve environmental stewardship. As a result, tourism and hospitality organisations promote sustainability awareness and encourage their personnel to engage in ECB (Soomro & Soomro, 2024).

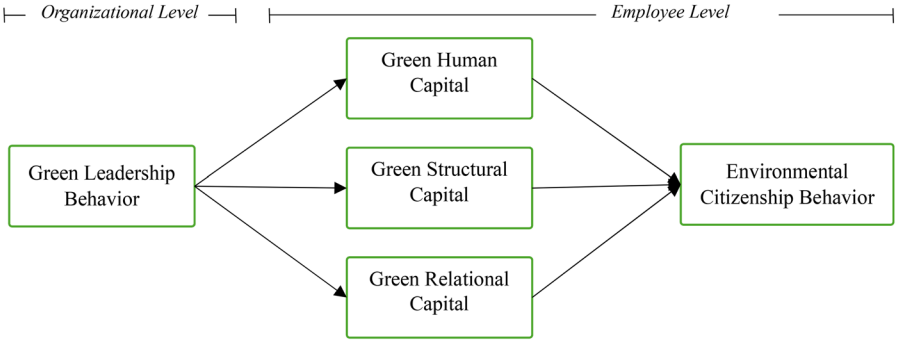

Figure 1. Conceptual model.

Participants and procedure

The data were derived from a survey conducted in tourism and hospitality organisations ($N = 16$) located in the TRNC. We purposively selected hotels based on their commitment to green and ecologically responsible practices focused on advancing and preserving the environment. Higher-rated hotels (four- and five-star) were chosen because they typically possess more significant resources to invest in sustainable practices and green leadership initiatives (Bani-Melhem et al., 2022).

Therefore, the selected sample comprised a mix of 9 four-star hotels and seven five-star hotels, each employing approximately 50 to 200 staff members. We utilised a pencil and paper method to collect data from front-line employees working in selected organisations, with access to the participants granted through the managers. Before the survey administration, respondents were informed of the study's objectives, the voluntary aspect of their involvement, and the confidentiality and anonymity of their responses. Participants were informed of their right to withdraw from the study at any time. To minimise potential standard method bias and ensure temporal separation of variables that mitigates potential biases of self-reported behaviors (Podsakoff et al., 2003), we collected data on GLB and employee ECB at Time 1 and data on GHC, GSC, and GRC at Time 2. At Time 1, we distributed 440 surveys, resulting in 356 usable responses with a response rate of 81%. At Time 2, we distributed the survey to those who responded at T1, and 264 valid responses were received, with a response rate of 74%. Responses were matched using a six-digit identification code. Of the 264 employees, 58% were men, with an average age of 25–34 years (SD = 1.17) and organisational tenure of 2.38 years (SD = 1.17). Additionally, 60% held a bachelor's degree, and 32% had a master's degree (see Table 2).

Measures

The measurement framework employed in this study is grounded in Signaling Theory. GLB was operationalized through a five-item scale from (Nawaz Khan, 2023). This scale captures the observable signals leaders transmit through actions like teaching and coaching on environmental issues. Employees further interpret and internalise these signals, as reflected in GIC dimensions, which were measured using fourteen items

Table 2. Descriptive statistics.

Constructs	Means	SD	1	2	3	4	5	6	7	8
Organisational level variable										
1. Green leadership behavior	2.48	1.02	–							
Individual level variables										
1. GHC	2.37	1.15	.39**	–						
2. GSC	2.44	0.98	.47**	.40**	–					
3. GRC	3.44	0.90	.12	.132*	.133*	–				
4. Environmental citizenship behavior	3.23	1.16	.56**	.51**	.48**	.43**	–			
5. Age	2.72	1.18	−0.08	−0.07	−0.08	−0.22**	−0.17**	–		
6. Gender	1.42	0.49	−0.03*	−0.2*	−0.04*	.36**	.22**	−0.24**	–	
7. Education	1.48	0.63	.08	.13**	.05	.12*	.09*	−0.17**	−0.08	–
8. Tenure	2.38	1.17	.08	.10	.08	.09	.20**	.17**	−0.18*	−0.04

Notes: $N_{individual} = 264$, $N_{organization} = 16$.

adopted from (Chen, 2007). For example, GHC reflects employees' belief in the importance of environmental protection, "Our employees believe that environmental protection is an important part of their work". GSC reflects the employees' perception of the organisational systems and policies supporting sustainability, "Our organisation has a clear policy on environmental protection". GRC reflects the strength of the organisation's external environmental partnerships and recognition, "Our organisation is recognised for its efforts in environmental protection", which emerges as a response to leadership signals. Finally, ECB is measured using a scale adapted from (Raineri & Paillé, 2016), which captures the behavioral outcomes of these interpreted signals, such as employees suggesting new practices to enhance environmental performance. These measures align with Signaling Theory by focusing on signal generation, interpretation, and resulting behaviors. It is important to note that these items capture employees' self-reported behaviors rather than externally observed or objectively verified actions. All items are anchored on a 5-point Lickert Scale (1 = strongly disagree and 5 = strongly agree). The full items for each construct can be found in Appendix 1 of the supplementary materials.

Aggregation test

The authors conceptualised GLB at the organisational level and aggregated it from individual to organisational level ratings. The study examined the intra-group agreement by determining the average rwg (j) score and inter-group variance by employing intraclass correlations (Laghi et al.) to support the aggregation process. Findings unfold that the average rwj (j) score for GLB for all the 16 selected companies was 0.83. It is above the benchmark value of 0.70, as suggested by LeBreton and Senter (2008). Furthermore, the scores for ICC1 and ICC2 were 0.45 and 0.71 respectively. To further verify the aggregation, the authors found the significance in the means of GLB ($F = 3.44$, $p < 0.001$) at the organisational level, supporting the aggregation process.

Analytical strategy

Our multilevel dataset consisted of 264 employees (Level 1) nested within 16 organisations (Level 2). We used multilevel modelling Krull and MacKinnon (2001), in which GLB (a Level 2 variable) influences ECB (a Level 1 outcome variable), which is mediated by GHC, GSC and GRC (a Level 1 variable). The analyses were conducted using Jamovi software with a maximum likelihood estimation. The indirect effect between GLB and ECB through GHC, GSC and GRC was calculated using the product-of-coefficients method.

Jamovi is a "third generation" statistical package designed for ease of use. Built on the R statistical language, it facilitates access to an extensive spectrum of advanced statistical tools and techniques developed by the statistics community. The authors employed Jamovi's mixed-model analysis to understand the relationships between variables. A two-level model was incorporated to strengthen the analysis: GLB at the higher level (Level 2) and all employee-level variables at the individual level (Level 1). This approach enabled a more comprehensive exploration of interconnections within the data, allowing for the identification of patterns and relationships that provide robust, generalisable insights.

Results

Confirmatory factor analysis (CFA) and endogeneity CFA of the GLB, GHC, GSC GRC and ECB measures were conducted. The hypothesised five-factor model yielded an acceptable fit to the data χ^2 (df = 289) = 544; CFI = 0.95; TLI = 0.94; RMSEA = 0.06; SRMR= .04. Moreover, all factors loading were significant at $p < 0.001$. In addition, the authors compared the five-factor model and simpler models with four factors: three factors, two factors, and one factor. The results of the chi-square difference tests indicate that the proposed five-factor model is a much better fit for the data than the evaluated alternative models. The robust results indicate that our measurement model effectively suited the data and accurately captured unique constructs (see Table 3). Furthermore, we investigated the convergent and discriminant validity *via* average variance extracted (AVE) and Heterotrait-Monotrait (HTMT) scores (Fornell & Larcker, 1981). Table 4 reveals that the AVE and HTMT scores were above 0.5 and below 0.9, respectively, suggesting convergent and discriminant validity is established (Hair et al., 2019).

Hypotheses testing

The authors ran multiple models using a mixed model (med mod function) in Jamovi 2.4.8. Table 5 presents an overview of the results of linear and multilevel models. In Step 1, only the organisational level identifier was entered as an explanatory variable in the null model. The estimate ($\gamma = 3.26$ se = 0.086 $p < 0.001$) shows a significant variation in the level 2 clustering variable (i-e. ID). The interclass correlation (ICC 0.160) indicates a 16% variance to ECB due to grouping variables. Step 2 shows the random intercept and fixed slope. The results ($\gamma = 0.698$ se = 0.088 $p < 0.001$) suggest a significant effect of organizational-level GLB on individual-level ECB. The results support a direct single-level effect (i-e. ECB) and a direct cross-level effect (i-e. organizational-level GLB on individual-level variables). Step 3 confirms the previous findings by demonstrating that the intercept and slope can vary simultaneously ($\gamma = 3.27$ se = 0.085 $p < 0.001$). Table 5 displays the L2 value of 0.32, representing the variance in slopes

Table 3. Comparison of measurement models.

Models	Factors	χ^2/df	CFI	TAG	SUMMER	RMSEA
Model 5	Five factors (GLB, GHC, GSC, GRC, ECB)	544/289	0.95	0.94	0.04	0.06
Model-4	Four factors (GLB, GHC, GSC, GRC, ECB)	1325/293	0.81	0.79	0.09	0.11
Model-3	Three factors (GLB, GHC, GSC, GRC, ECB)	1875/296	0.71	0.68	0.09	0.14
Model-2	Two factors (GLB, GHC, GSC, GRC, ECB)	2653/298	0.57	0.53	0.14	0.17
Model-1	One factor (GLB, GHC, GSC, GRC, ECB)	3073/299	0.50	0.45	0.15	0.18

Table 4. Convergent and Discriminant Validity.

	ECB	GHC	GLB	GRC	GSC	Average Variance Extracted (AVE)
ECB						0.737
GHC	0.542					0.837
GLB	0.599	0.428				0.774
GRC	0.467	0.144	0.14			0.715
GSC	0.517	0.442	0.518	0.146		0.731

Table 5. Results of Multilevel Modeling.

	Model			
Level and Variable	Null (Step-1)	Random Intercept and Fixed Slope (Step-2)	Random Intercept and Random Slope (Step-3)	Cross-level Interaction (Step-4)
Level 1				
Intercept	3.26** (0.086)	3.23** (0.064)	3.27** (0.085)	3.32** (0.069)
ECB		0.541** (0.084)	0.580** (0.085)	0.425** (0.103)
Level 2				
Green leadership		0.698** (0.088)	0.835** (0.110)	0.388** (0.098)
Cross-level interaction				
Green leadership behavior and environmental citizenship behavior				0.314** (0.079)
Variance components				
Within-group (L1) variance	1.130	0.530	0.336	0.114
Intercept (L2) variance	0.215	0.858	0.333	0.154
Slope (L2) variance (τ11			0.697	0.648
Additional information				
ICC	0.160	0.247	0.325	0.182
−2 log likelihood (FIML)	−409.480*	−382.388	−370.444	−344.235
(Pseudo) R^2	0	0.361	0.462	0.478

Note: *$p < .05$. **$p < 0.01$.

across different groups. The findings obtained from the bootstrap confidence interval, the −2 log-likelihood, and the Crainiceanu and Ruppert (2004) test indicate that this value is unlikely to be zero in the overall population. It helps address variations at the organisational level in the connection between GLB and individual-level ECB, highlighting the importance of identifying the specific variable(s) that account for this variability. The final step in the model-building process entails determining if a specific L2 variable can account for a portion of the slope variation across different levels. The results confirm the presence of the cross-level interaction effect that we examined. According to Table 5, the relationship between individual ECB and GLB is projected to have a slope of 0.379, with a standard error of 0.144 and a significance level of less than 0.001. This relationship is based on the average level of GLB.

Table 6 reports the results of multilevel hypotheses. In support of H1, we found that GLB was positively related to ECB (γ = 0.48, $p < 0.01$; H1 supported). Concerning the indirect effects, we found a positive indirect effect of GLB on ECB through GHC (indirect effect = 0.15, 95% CI [0.090; 0.215]; H2 supported); a positive indirect effect of GLB on ECB behavior through GSC (indirect effect = 0.14, 95% CI [0.080; 0.214]; H3 supported) and positive indirect effect of GLB on ECB through GRC (indirect effect = 0.05, 95% C001; 0.100]; H4 supported). The analyses were conducted with and without control variables to establish robustness. (Schjoedt & Sangboon, 2015). We found no differences in the results of our proposed hypotheses.

Table 6. Multilevel Hypotheses Testing.

Path	Estimate	SE	95% LLCI and ULCI
Green leadership behavior → ECB	.48**	0.05	.369;.597
Green leadership behavior → GHC → ECB	.15**	0.03	.090;.215
Green leadership behavior → GSC → ECB	.14**	0.04	.080;.214
Green leadership behavior → GRC → ECB	.05*	0.02	.001;.100

Notes: N (individual) = 264, N (organisation) = 16.

Discussion

This study created a comprehensive research model that put forward four hypotheses. The first hypothesis was supported, suggesting a direct and positive association between GLB and ECB, both at an individual and organisational level. This is in agreement with prior research conducted by Farrukh et al. (2022) and Shafait and Huang (2024). This outcome indicates that GLB is associated with ECB. When leaders appreciate environmentally conscious principles and practices, they demonstrate a stronger likelihood of inspiring employees to realise environmental objectives. Furthermore, GHC, GSC, and GRC serve as a mechanism through which GLB affects employee ECB. It suggests that in a workplace where leaders endorse environmental stewardship, employees believe that their leadership supports environmental efforts, appreciates contributions to environmental protection and prioritises well-being. Therefore, GLB is associated with stakeholders to perform voluntary and discretionary activities to conserve the natural environment. These outcomes corroborate the principles of signalling and COR theories (Bafera & Kleinert, 2023; Friske et al., 2023), reinforcing the precepts that leadership has a critical role in the formulation and execution of policies for the protection of the environment.

Theoretical implications

The study provides several important theoretical implications. By examining the association between GLB and ECB, it provides new insights into the current academic discourse. Prior studies have discussed the connection between sustainable leadership and environmentally responsible behaviors (Asante, 2024; Khan et al., 2023; Shafait & Huang, 2024; Tuan, 2020). However, limited focus has been on comprehending the phenomena using a multilevel mediation model. Farrukh et al. (2022) argue that it is important to use a study design that includes both micro and macro-level views to gain a more comprehensive understanding of the impact of organisational initiatives. Therefore, our study examines the factors at the organisational level that contribute to environmental sustainability.

We contribute to the expanding theoretical viability of managers' GLB in predicting frontline employee outcomes within the tourism and hospitality context (Aboramadan et al., 2022). While the existing scholarship on green leadership has addressed broad leadership styles, our study directly examines ECB demonstrated by leaders as key predictors of frontline employees' citizenship outcomes. We argue that our study extends this behavior-focused conceptualisation of green leadership in several ways. First, we consider green leadership a Level 2 variable, explicitly focusing on frontline managers. Second, we theorise its signalling potential for frontline employees. We

propose that when managers exhibit GLB, they transmit clear signals to frontline employees on the significance of environmental sustainability (Nawaz et al., 2025; Soomro et al., 2025). These signals help reduce information asymmetry, ensuring frontline employees recognise and internalise the significance of green initiatives. In response, employees are more likely to report engaging in sustainable behaviors and contributing to environmental citizenship outcomes. Signalling theory has not yet been applied to examine the impact of GLB on employees' ECB, making this a pioneering addition to the literature.

Erstwhile literature has primarily explored the direct association between GIC and green performance (Jiang et al., 2024; Naseem et al., 2024; Shahbaz et al., 2024; Shehzad et al., 2023; Soomro & Soomro, 2024). While others have also explored antecedents of GIC (Chang & Chen, 2012) and its consequences (Haldorai et al., 2022; Yong et al., 2019), there remains a critical gap in understanding how GIC functions as a mediating mechanism in leadership-driven environmental behavior. This study uniquely addresses this gap by leveraging signaling theory and COR theory to examine the multilevel mediating role of the GHC, GSC, and GRC in the relationship between GLB and employee ECB. This mediation-based perspective advances the literature by moving beyond simple direct effects and uncovering how GIC translates leadership influence into pro-environmental employee behaviors. By shifting the focus from GIC as an outcome or direct predictor to a key enabler in leadership-driven sustainability efforts, this research extends novel theoretical contributions to fostering green behavior within organisations.

The result revealed that GHC, GSC, and GRC significantly mediate the relationship between GLB and ECB. Notably, GHC has an essential role in executing the eco-friendly policies formulated at the strategic level, which are reflected in the form of a voluntary and discretionary exhibition of sustainable behaviors. This aligns with previous research indicating that GHC enables organisations to address environmental challenges when supported by top management (Chen, 2007; Nisar et al., 2021; Tran et al., 2023). Furthermore, the results revealed that GRC and GSC are vital in fostering strong partnerships that prioritise environmental conservation and encourage prosocial behaviors. Leveraging COR theory, this study suggests that intellectual capital within organisational relationships and structures can enhance cooperation among supply chain members to minimise environmental waste (Laghi et al., 2022; Wu et al., 2022). Consequently, GLB should focus on resource accessibility and relationship-building to establish social networks and coordinate stakeholder activities, which are critical for effectively leveraging these relationships to promote climate-friendly behaviors. By positioning GIC as a key enabler rather than merely an outcome or predictor, this study provides novel theoretical insights into how leadership-driven sustainability efforts can cultivate green behavior within organisations.

Practical implications

This study provides several managerial implications. First, a leader's eco-consciousness is critical in inspiring and promoting environmental stewardship among followers (Hasan et al., 2024; Poetz & Volmer, 2024). To foster employee ECB within hospitality organisations, leaders must communicate and embed eco-centric vision symmetrically to all levels of management. Given this, tourism and hospitality organisations should

prioritise hiring managers firmly committed to environmental sustainability. This necessitates a strategic shift in HR practices, particularly in the selection process. HR departments should revise the selection criteria for managerial positions to emphasise green orientation and sustainability-focused behaviors. For instance, competency-based interviews can ask candidates for concrete examples of how they have previously integrated sustainability into their roles and the initiatives they have implemented. Additionally, HR can use performance management records for internal candidates to evaluate their demonstrated commitment to citizenship behaviors. So, by embedding sustainability into managers' selection processes, organisations can instil principles of environmental citizenship from the top down.

Given the central responsibility of managers in signaling green priorities among frontline employees, tourism and hospitality organisations should invest in targeted leadership development programs. These initiatives can take various forms to ensure managers are well-equipped to promote sustainability. For instance, management training programs should incorporate environmental awareness as a core curriculum component. Coaching programs and multi-source feedback processes should also integrate sustainability-related insights, allowing managers to reflect on and enhance their green leadership capabilities. The outputs from these feedback mechanisms should be incorporated into personal development plans and leadership growth objectives. Furthermore, leadership development activities should actively promote GLB through structured exercises. These activities can help managers and employees internalise environmental values and practice sustainable behaviors. Such training sessions strengthen organisational commitment to sustainability and provide frontline employees with the requisite resources and support to generate, construct and operationalize green initiatives in their daily work.

Limitations and future directions

No study without limitation. This investigation is confined to the sample size of the hotel industry in TRNC. More scholarly inquiry is required to ascertain the extent to which GLB is essential for the hospitality sector in developed and emerging countries. Second, our empirical investigation specifically concentrates on an intangible asset, i.e. GIC. Earlier investigation has reported that climate (change) engagement noticeably impacts a firm's strategy and actions related to environmental behaviors (Cerdeira & Rimkutė, 2024; Tao et al., 2024). Thus, due to the indisputable influence of climate (change) engagement, this study proposes an additional investigation into the potential mediating impact of climate (change) engagement to comprehend the connection between GLB and ECB thoroughly. While targeted sampling aligns with the research objectives, it may limit generalizability to other contexts, such as smaller or lower-rated hotels. Furthermore, this study took every step recommended by past studies to mitigate the potential biases (e.g. social desirability bias) associated with self-reported measures (e.g. ensuring anonymity, assuring respondents of confidentiality, using validated survey instruments, and incorporating temporal separation of variables), it may not eliminate such biases. Subsequent research may overcome this constraint by integrating objective metrics, triangulating data from diverse sources, applying the theory of planned behaviour, or adopting experimental designs. Although the study does not claim definitive causality, the directional relationship implied (i.e. from GLB

to ECB) is grounded in signaling theory and supported by a multilevel structure that reduces common method bias. Still, future research using longitudinal or experimental designs could more robustly confirm the temporal ordering and causal dynamics.

A past study has also suggested that hotel star ratings (e.g. 5-star vs. 4-star) may influence the outcomes of hotels' pro-environmental practices (Tran et al., 2025). Moreover, this investigation did not consider the impact of individual characteristics (e.g. educational level, environmental consciousness) on the association between the variables of the study. For instance, past studies have argued that an individual's ability to engage in prosocial behavior may vary based on their educational level (Erdogan et al., 2015). Earlier research has demonstrated that participants' environmental consciousness and knowledge can influence their engagement in environmental initiatives (Kautish et al., 2019). Hence, prospective research should consider how employee characteristics (e.g. educational level, environmental consciousness) and hotel characteristics (e.g. 5-star vs. 4-star) moderate the relationship between GLB and ECB. Relatedly, as the majority of participants in this study held a bachelor's degree—an educational profile that may not reflect the typical qualifications of front-line employees in the hospitality sector in countries outside TRNC—replicating the study in organisations with more diverse educational profiles would enhance the generalizability of the findings.

Author contributions

CRediT: **Suhaib Ahmed Soomro**: Conceptualization, Methodology, Resources, Software, Conceptualization, Data curation, Formal analysis, Supervision, Writing – original draft; **Shuaib Ahmed Soomro**: Conceptualization, Methodology, Resources, Software, Conceptualization, Data curation, Formal analysis, Supervision, Writing – original draft; **Blend Ibrahim**: Writing – original draft; **Ahmad Aljarah**: Supervision, Writing – review & editing.

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Data availability statement

Data will be made available on request.

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