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Article

Fostering a greener workplace: Assessing the impact of green human resource and low carbon behavior

Agyemang Kwasi Sampene[1], John Wiredu[2,*]

[1] School of Management, Jiangsu University, Zhenjiang 212013, China
[2] School of Management, Northwestern Polytechnical University, Xi'an 710072, China
*** Corresponding author:** John Wiredu, johnwiredu50@gmail.com

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Abstract: Businesses in China are embarking on a transformative agenda, as reflected in their environmental performance, which signals a strategic shift towards fostering sustainability initiatives in the workplace. Accordingly, the research explores how green human resource management, organizational commitment, and green innovation climate drive low-carbon behavior and environmental performance. The research gathered 580 responses from senior staff among Chinese small and medium-sized enterprises. The partial least square structural model was employed to assess the study hypothesis. Key study findings are enumerated: First, green human resource management boosts green organizational commitment, green innovation climate, and low-carbon behavior. Second, the data showed that a green innovation climate and organizational commitment enhance low-carbon behavior. Third, according to the study, low-carbon promotes environmental performance. Fourth, the paper analysis showed that low-carbon mediated the connection between green human resources and low-carbon behavior. Fifth, this research outcome highlighted that environmental knowledge moderates the linkage between low-carbon behavior and environmental performance. This finding enriches the debate on green human resource management and how to promote low-carbon behavior and environmental performance.

Keywords: green human resource management; green organizational commitment; green innovation climate; environmental performance; low carbon behavior

1. Introduction

One significant challenge affecting the sustainability of humanity and natural resources is global environmental degradation. Due to the high-rate trends of CO_2 emissions and greenhouse gas emissions, all countries must consider their economic and environmental challenges [1–3]. Moreover, as Wiredu et al. [4] indicated, humans must address the world's most critical concerns, such as environmental pollution, which has emerged due to the reckless pursuit of economic gains at the expense of social and ecological benefits. Although SMEs promote economic growth and create jobs, new business models and technological change have become increasingly necessary. Thus, it is worth solving these problems by investigating how SMEs can improve their environmental performance (EP). Since SMEs operate mostly in a community, they cause environmental pollution [5]. This research focused on China because the country stands among the globe's most populous nations and is a significant player in the world economy, especially in the SME sector. China has initiated numerous policies and plans to promote green practices as a country actively addressing ecological issues and challenges and is committed to

achieving sustainable development. Focusing on China, this paper seeks to contribute novel insight into the mechanisms that drive low-carbon behavior (LCB) from the perspective of SMEs operating in the evolving Chinese business sector.

Low-carbon behavior (LCB) has become a topic of discussion in improving environmental sustainability among businesses. LCB can be defined as the intentional awareness and practices people engage in to avoid potential adverse environmental effects [6]. LCB involves the implementation of eco-friendly and sustainable habits in industrial processes, business operations, and daily life to mitigate climate change. This concept encourages organizations, communities, and individuals to prioritize environmentally responsible actions, energy efficiency, and renewable resources. Therefore, it is essential to understand the drivers of SMEs' staff's LCB and how it affects their EP. Accordingly, GHRM, as demonstrated by prior studies, is an innovative approach to managing human capital within organizations that prioritizes sustainability and ecological responsibility [7,8]. Additionally, GHRM incorporates environmental factors into HR procedures, including hiring, training, performance reviews, and staff involvement [8]. The focal point of GHRM is to foster a culture of sustainability within the workforce, encouraging employees to adopt eco-conscious behaviors at work and in their personal lives. Moreover, to mitigate these toxic emissions, SMEs have begun creating a green innovation climate (GIC) to reduce the environmental repercussions of production processes. GIC is an innovation aspect that focuses on eliminating waste, controlling emissions, and integrating environmental practices [9,10]. Also, the GOC of employees has been established by existing literature to be a significant predictor of the LCB of individuals [11,12].

Additionally, environmental knowledge (ENK) is recognized as an essential internal resource that enables individuals to adapt and understand the dynamic ecological landscape. Thus, ENK empowers businesses to identify sustainable initiatives that comply with environmental regulations and reduce resource consumption, ultimately enhancing the company's resilience and reputation. Existing literature has also predicted the role of ENK in enhancing LCB and EP [13]. Hence, this research explores the moderation role of ENK in the research model. ENK is the classical sense of factual information, such as knowledge about ecosystem processes, functions, and structures [14]. Hence, this study argues that adding ENK as a moderator is essential to understanding how it can enhance LCB and EP. Subsequent literature has established the direct effect of ENK on LCB [15,16], but a theoretical gap exists on the moderation role of ENK in this relationship. Hence, this study fills this gap by providing empirical findings on the influence of ENK on the relationship between LCB and EP. The objectives of this research include:

(1) Exploring the influence of GHRM on GIC, GOC, and LCB.
(2) Investigate the impact of GIC and GOC on LCB.
(3) Analyze the impact of LCB on EP.
(4) Determine the mediation effect of LCB on the connection between GHRM and EP.
(5) Lastly, evaluate the moderation role of ENK on the link between LCB and EP.

Based on the research objectives, the formulated research questions are as follows:

RQ (1) How does GHRM influence green innovation climate, green organizational commitment, and low-carbon behavior? RQ (2) What is the impact of GIC and GOC on LCB? RQ (3) How does LCB affect environmental performance (EP)? RQ (4) Does LCB mediate the relationship between GHRM and EP? RQ (5) What is the moderating role of environmental knowledge (ENK) in the relationship between LCB and EP?

This article enriches the body of knowledge in environmental and GHRM literature by dissecting how green organizational commitment, green innovation climate, environmental knowledge, and low-carbon behavior stimulate environmental performance. This finding enriches the discussion on the importance of GHRM and the appropriate mechanisms needed to strengthen LCB and EP. The novelty of this paper involves the comprehensive assessment of the pathway toward fostering low-carbon behavior, incorporating a multi-dimensional framework. The paper uniquely integrates the domains of GHRM, GOC, and the GIC to elucidate their collective impact on promoting environmentally conscious behaviors. Furthermore, the research introduces the moderation effect of ENK, emphasizing the significance of individual awareness and understanding of environmental issues in influencing the interplay between organizational practices and LCB.

Theoretically, this study comprehensively analyses the pathway to fostering low-carbon behavior within organizations, drawing upon the ability, motivation, and opportunity (AMO) theory. The paper integrates key elements, including GHRM practices, GOC, and a supportive green innovation climate. In addition, the integration of GHRM, GOC, and GIC underscores the connection of these indicators in fostering LCB and EP. The study also recognizes the essential role individuals within the enterprise play in stimulating EP and emphasizes the importance of supportive organizational innovation and culture in improving LCB. The mediation analysis provides a holistic approach to understanding the mechanism through which LCB can improve the nexus between GHRM and EP. Hence, the current analysis provides enormous practical implications for scholars, stakeholders, and government, providing a roadmap for improving environmentally responsible practices among SMEs in China. Lastly, this paper employed the PLS-SEM, which provides a unique statistical tool to assess a research model's direct, indirect, and moderation effects.

This research is original in its integrated exploration of green human resource management, organizational commitment, and green innovation climate as key drivers of low-carbon behavior and environmental performance within Chinese SMEs. It uniquely identifies the mediating role of low-carbon behavior between green HR practices and environmental outcomes and the moderating effect of environmental knowledge on the relationship between low-carbon behavior and environmental performance. These novel insights contribute to the growing discourse on fostering sustainable workplace practices, offering practical implications for enhancing environmental performance through strategic human resource and innovation initiatives.

This study was divided into six central portions. The primary subjects of Section 1 are the study's history, objectives, and significance to ecological sustainability. Section 2 captures the theoretical background and statement of the

hypothesis. The procedures employed are described in Section 3. The conclusions from the PLS-SEM investigation are further provided in Section 4. Section 5 emphasizes this paper's interpretation, which has implications for theory and practice. Section 6 offers the conclusion and suggestions for additional research.

2. Literature review and hypothesis formulation

The literature review commenced by meticulously assessing relevant search engines, including Web of Science, Scopus, and PubMed platforms, to provide transparency and rigorous evaluation of prior literary works. Considering targeted search terms such as "GIC", "GOC", "LCB", "GHRM," and "EP", the study systematically went through the abundance of literature, making sure every piece was relevant to the main themes of the current. The literature process focused on peer-reviewed articles. Following stringent publication guidelines from 2002 to 2024, the study sorted through the papers we had retrieved and ensured they fit the objectives of the current study. Using a systematic approach made obtaining a large dataset of academic publications for analysis easier. It guaranteed that the publications were categorized according to their relevance to the research questions. The next section of the literature focused on the theory and hypothesis outlined in the study.

AMO theory proposed by Appelbaum et al. [17] has been generally applied in analyzing the performance of GHRM practices. As suggested by the AMO theory, GHRM practices affect staff's ability (for instance, training and development, recruitment process), motivation (for instance, compensation, reward system, and incentives), and opportunity (for instance, empowerment and teamwork) to promote overall SMEs performance [18]. The AMO theory provides a comprehensive theoretical model for understanding the nexus between the key variables influencing LCB and EP. GHRM is essential in improving employees' abilities by fostering knowledge and skills associated with environmental stability [19]. In addition, GOC contributes to the motivation aspect of the AMO by instilling a sense of shared direction and value to environmental goals. Furthermore, creating GIC provides the necessary opportunities for staff to participate actively in ecologically friendly actions. Additionally, ENK acts as a catalyst, facilitating the integration of green actions and practices within the firm. These concepts create a synergistic influence, aligning organizations and individuals' abilities, motivation, and opportunities towards engagement in LCB and enhancing firms' EP.

The RBV was proposed by Barney et al. [20], where the researcher argued that an enterprise's success or growth depends on internal resources, indicating that inadequate resources hinder a firm's growth and development. This theory focuses on a firm's internal resources to create a competitive advantage [21]. Internal resources combine all available facilities and strengths to help enhance the development of firm value co-creation activities [22]. Moreover, the RBV theory stresses that firm performance and competitive advantage depend on how it can utilize the available strategic internal resources that are valuable, rare, imitability, and organization (VRIO) to be copied by a rival enterprise in the market [23]. Hence,

in this study, the researcher applied the RBV to analyze the EP of firms; thus, these concepts were linked to this theory, which includes (GIP, GOC, and ENK).

2.1. Hypothesis on GHRM

GHRM refers to HR policies and practices that motivate, inspire, and empower employees in a firm to engage in GIC, GOC, and LCB, eventually improving enterprises' EP. This section of the paper provides empirical studies exploring the influence of GHRM on GIC, GOC, and LCB. For example, Elshaer et al. [24] reported that GHRM directly impacts two different types of LCB (proactive and task-oriented). Their research further revealed that employee LCB mediates the linkage between GHRM and EP. Moreover, in Malaysia, the analysis by Naz et al. [25] explored the role of GHRM practices toward the LCB. Their research outcome indicated that GHRM (green discipline and green training and development) are essential predictors of LCB among 374 green hotel workers. Also, their study showed that GHRM indirectly improves EP through the LCB of the workforce. In addition, Ansari et al. [26] assessed the influence of GHRM on GOC and LCB. The empirical outcomes showed that GHRM affects staff GOC and LCB. Moreover, their findings indicated that GOC mediates the connection between GHRM policies and LCB. Shah and Soomro [27] explored the connection between GHRM and GIC among automobile firms in Pakistan. The study found a direct nexus between GHRM practices such as performance, rewards, compensation, development, and GOC. Similarly, Meng et al. [28] assessed the influence of GHRM on LCB, and the research employed a green lifestyle as the intermediary indicator and green share values as the iterative factor. Their study received 347 responses from hotel staff in China. The empirical results from the PLS-SEM approach indicated that GHRM has a favorable linkage with staff LCB and green lifestyle. The conclusion from the research proved that GHRM stimulates employees' LCB. Therefore, based on empirical evidence and the AMO theory, this research suggests that:

H1: GHRM contributes positively and significantly to GIC among SMEs.

H2: GHRM contributes positively and significantly to GOC among SMEs.

H3: GHRM contributes positively and significantly to LCB among SMEs.

2.2. GIC and LCB

GIC relates to all aspects of innovation targeted at pollution control, energy preservation, waste reduction, waste reprocessing, and ecological management initiatives. GIC activities have been related to firms engaging in eco-friendly products, using advanced technology for production, green skills, clean technology, efficient use of resources, and creating a green workplace environment as outlined by the RBV model [29,30]. GIC is an intermediary mechanism enterprises use to control environmental pollution and improve the organization's EP. Moreover, GIC relates to enterprise environmental management strategies that stimulate LCB and environmental performance. The direct association between proactive actions such as GIC and EP through environmental practices has been established [31,32]. LCB denotes employees' attitudes and behavior towards GIC, climate change, and low-carbon society. These studies acknowledge that firms' GIC is an essential factor that

improves LCB [33–35]. Grounded on the above explanation and the AMO theory, this paper suggests that:

H4: GIC positively and significantly influences stimulating LCB among SMEs.

2.3. GOC and LCB

GOC is defined as the perceived feelings and obligation to protect environmental degradation, assuming employees more committed to the environment are more likely to participate in LCB. Organizational commitment toward a particular program ensures highly committed workers have a higher GIC and improve LCB, established in the RBV theory [36]. GOC optimizes the relative strengths of staff relationships and identification with green initiatives proposed by their firm. GOC develops employees' faith to help firms implement green projects and plans to enhance LCB [37]. The three most important GOC concepts are continuance, affective, and normative commitment [38]. Firms' recognition, affiliation, and participation in achieving set objectives, such as higher EP, can be classified as affective commitment. According to the RBV proposition, the awareness of the consequences of not engaging in the preservation of the environment leads to a continuance of commitment. Normative commitment relates to the alleged obligation to sustain a higher level of EP [39–41]. Likewise, Fatima et al. [42] indicated that these concepts of GOC have a significant association with other factors like employment sustainability and LCB. Accordingly, this study suggests that:

H5: GHRM contributes positively and significantly to building LCB among SMEs.

2.4. LCB and EP

LCB is defined as improving the concept of a low-carbon environment through behavior such as energy conservation, recycling, and promoting environmental sustainability. Achieving environmental sustainability is an urgent agenda item for firms that want to simultaneously achieve economic goals and more outstanding EP [25,43]. Furthermore, Darvishmotevali et al. [43] specified that worker LCB significantly impacts EP. Employees' active participation in environmental decisions and LCB that address environmental challenges are presumed to be effective mechanisms and strategies for firms to become environmentally responsible, thereby improving EP [44,45]. The AMO theory captures that people's actions, especially those of employees in a firm, can directly affect the achievement or the non-achievement of firms EP [46]. Hence, Sampene et al.'s [47] study revealed that various environmental efforts, including new sustainable product development, processes, models, and technological advancements, are strategies SMEs can utilize to mitigate environmental dilapidation and increase EP. In this study, the researcher contends that engaging in LCB at the workplace will enhance SMEs' EP. Thus, a higher level of LCB will lead to a higher level of EP. As a result, this study hypothesized that:

H6: LCB positively and significantly influences EP.

2.5. Mediation of LCB

LCB comprises employee behavior that contributes to the improvement of environmental sustainability. Such behavior is generally shown in the workplace (such as waste separation, energy preservation, and sharing information about ecological sustainability among employees) [48]. People's behavior significantly contributes to the destruction of the environment through water and land, loss of biodiversity, and pollution from chemicals. LCB is generally associated with environmental challenges [49]. Kim and Lee [50] suggest a tripod of antecedents that affect people's LCB, including their exceptional traits, their results and actions, and the environment in which people exist by mutually affecting each other. Prior literature has revealed different categories of a person's LCB depending on the level of effort and engagement (for instance, individual to collaborative engagement) [50,51]. From the perspective of the AMO theory, this will stimulate the employee's discretionary sense and responsibilities towards the GOC and increase their LCB. Thus, the staff becomes more responsible for tasks and activities that promote ecological sustainability and meet the GHRM targets, enhancing the firms' EP [52]. Accordingly, the current article proposes that LCB mediates the link between GHRM and EP.

H7: LCB mediates the link between GHRM and EP.

2.6. Moderation of environmental knowledge

ENK refers to an individual consciousness about the consequences of their actions and actions (use of harmful chemicals and products) on the natural ecosystem. Employees are known for applying their expertise, experience, and talents to meet the needs and objectives of the business. Nevertheless, one's ENK may or may not participate in LCB, and as a result, the effect of LCB on firms' EP may depend on employees' ENK level [53]. In support of the RBV theory, employees with ENK are essential resources for adopting, developing, and executing green marketing and innovation, which affect firms LCB and EP. Moreover, ENK of staff drives them to think outside the box, provide solutions to environmental problems, and further engage in LCB, improving firm EP [54]. ENK, according to the RBV model and Paço and Lavrador [55], is the pursuit of alertness and knowledge about environmental issues to solve this challenge. Environmentally conscious individuals are more likely to purchase organic, natural, and green items and participate in green initiatives [56,57]. Employees at ENK have the potency to motivate tasks and actions to promote environmental stewardship, which results in LCB and EP [58]. Naz et al. [25] found that ENK moderates the association between LCB and EP among Chinese firms. The influence of the moderation of ENK on the interplay among LCB-EP remains limited in environmental studies. Hence, this study argues from the RBV model context that the ENK level among employees can enhance the interplay between LCB and EP. Moreover, this paper proposes that staff with a greater level of ENK are expected to put this accumulation of knowledge into practice by demonstrating LCB compared to those with lower levels of ENK. Thus, this investigation hypothesizes that:

H8: ENK positively moderates the link between LCB and EP.

2.7. Knowledge gap

To further clarify the knowledge gaps and the theoretical foundation of this study, we elaborate on the gaps in the current literature and justify the importance of examining these relationships. Despite the extensive literature on GHRM, organizational commitment, and green innovation climate, there is limited research exploring the combined impact of these factors on fostering low-carbon behavior and enhancing environmental performance. Specifically, the mediating role of low-carbon behavior and the moderating influence of environmental knowledge have not been thoroughly addressed in prior studies. Utilizing the AMO theory, this study aims to fill these gaps by providing a clear framework on how GHRM practices enhance employee ability, motivation, and opportunity to engage in low-carbon initiatives, promoting an organizational climate conducive to green innovation and environmental performance. The assumptions underlying the proposed relationships are based on the premise that GHRM enables employees to adopt sustainable behaviors, subsequently leading to enhanced environmental outcomes. This approach, grounded in AMO theory, offers a comprehensive understanding of the mechanisms through which green HR practices can drive sustainability in the workplace, thereby contributing valuable insights to the ongoing discourse on environmental performance in organizational settings.

2.8. Conceptual model

The conceptual archetype for this paper is displayed in **Figure 1**.

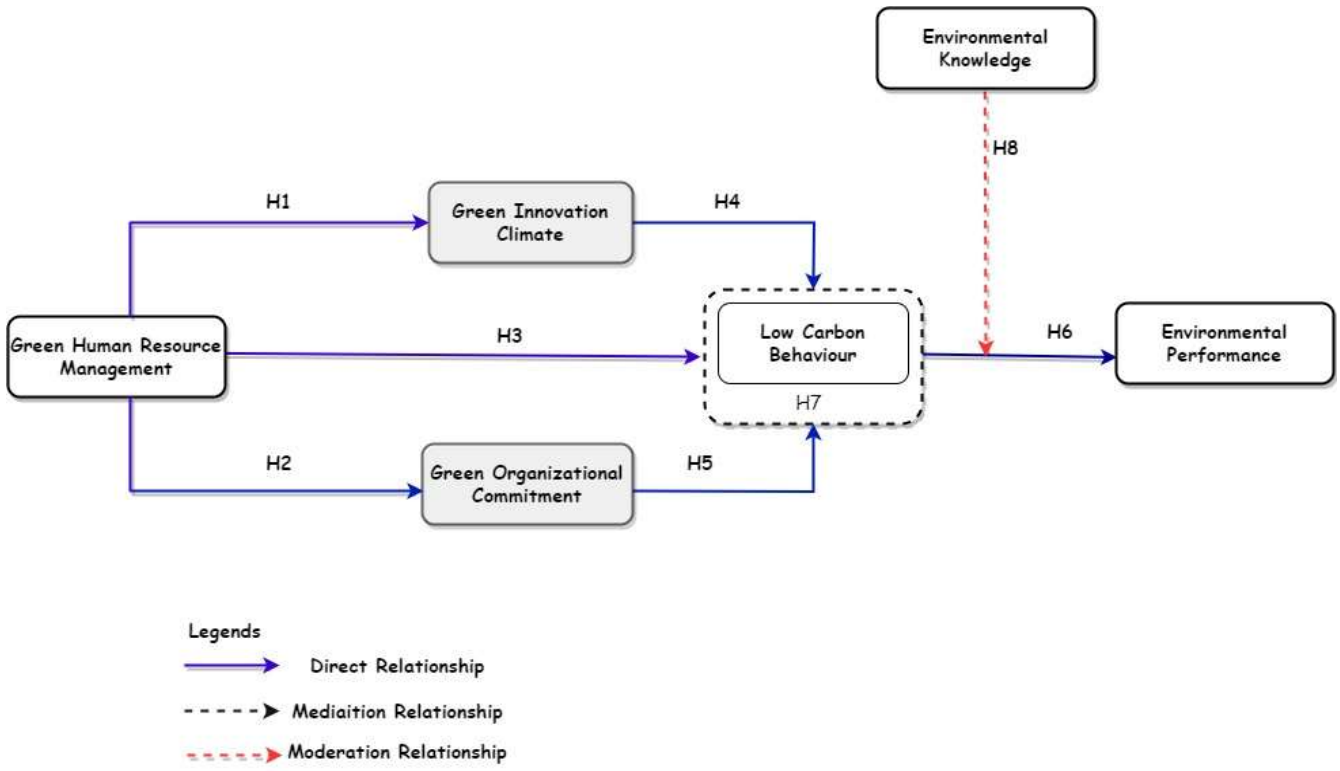

Figure 1. Conceptual model of the study.

3. Research methodology

3.1. Context selection

Ecological issues in China remain pressing, with industrial emissions exerting significant strain on water, air, and environmental quality. Despite efforts to curb pollution, challenges persist, affecting health and ecological balance nationwide. Hence, collaborative efforts and stringent regulations are imperative to alleviate the environmental pollution impacting China's landscape. Accordingly, this paper focused on top-level managers from SMEs in diverse cities in Jiangsu, including Nanjing, Zhenjiang, Suzhou, Wuxi, and Changzhou. The selection of Jiangsu province stems from its renowned economic and industrial prowess, making it an ideal setting to explore the dynamics of environmental initiatives within the workplace. In addition, Jiangsu's proactive approach to sustainable development and environmental conservation fits in nicely with the goals of our study, offering a favorable setting for analyzing how environmental knowledge influences workplace practices and performance results. The study targets small and medium-sized enterprises (SMEs) in Jiangsu, China, which represents a significant hub of industrial activities, with over 13,000 enterprises actively contributing to the province's economic output [59]. These SMEs are characterized by their adaptability, innovation potential, and substantial influence in local supply chains, which makes them critical drivers of regional sustainability efforts. The enterprises selected for this research vary in size, industry, and stages of digital transformation, providing a diverse representation of the SME sector. Focusing on Jiangsu is justified by the province's strategic role in China's economic development and its prominence in manufacturing and technological innovation. SMEs in this region are particularly under pressure to align with China's sustainability agenda, making them a relevant context for understanding how green human resource management practices and low-carbon behaviors can enhance environmental performance.

3.2. Operationalization of constructs

Employing a comprehensive strategy and improving the questionnaire's precision, the research employed the five-point Likert scale questionnaire designed for conducting surveys and gathering data. Considering the participants' diverse backgrounds and acknowledging English as a predominant communication channel, ensuring language accessibility was important in this study. Hence, the questionnaire was meticulously translated into Chinese to address this issue. Five bilingual experts with extensive international academic experience were recruited to evaluate the questionnaires' ease of understanding. These experts worked together to guarantee that the questionnaires were adapted as smoothly as possible. To improve the validity of the questionnaires, professionals from business and academia were consulted, and the survey questions were refined to adhere to established constructs. Additionally, pilot research was conducted, and the target audience was provided with updated survey questionnaires to fill out. This pilot study provided invaluable input for improving indicators and supporting the validation procedure, emphasizing the iterative process inherent in creating questionnaires.

The main questionnaire was categorized into two main sections. Thus, the first section included descriptive information about the participants. The second section outlined the measurement of the constructs. The construct of GHRM was retrieved from Ren et al. [60] and Bin Saeed et al. [45] and measured with six items. GIC was evaluated with five items taken from the research by Fatoki [61] and Makhloufi et al. [62]. GOC was evaluated with six items generated by Iqbal et al. [63]. Also, the studies retrieved LCB constructs, including seven items by Lange [64] and Bin Saeed et al. [45]. Five items were employed to assess ENK, and the measures were sourced from Karmoker et al. [18] and Usman et al. [65]. The study measured EP with five items adapted from Ubeda-Garcia et al. [66]. The appendix contains information about measuring items, including their respective codes and sources.

3.3. Sampling approach and data collection process

The research's philosophical background aligns with the positivist paradigm, which uses deductive mechanisms to understand an underlying phenomenon [67]. The study used purposive sampling to select the SMEs. The purposive sampling approach ensured the inclusion of SMEs with varying capacities and challenges in sustainability, allowing for an in-depth exploration of the factors driving green initiatives in this crucial economic sector. Therefore, the study applied Brewer and Miller [68] to calculate the sample size, which is outlined as follows:

$$n = \frac{N}{1 + N(\propto^2)}$$

here

N = represents the sample frame

n = depicts the size of the sample

$\propto$ = identifies the level of significance

The sample size calculation included a confidence level of 95% with a 5% margin of error. Hence, the level of significance is set at 0.05. Hence:

$$n = \frac{1300}{1 + 1300(0.05^2)}$$

$$n = \frac{1300}{4.25}$$

Hence, $n = 305.88$.

Based on the result from this calculation, the study's sample size is estimated to be 306. Accordingly, the study increased the sample size to 675 respondents from different SMEs across the Jiangsu province to gather accurate data and cover incomplete, unreturned, and unanswered questionnaires. The study employed online (use of emails) and physical data collection modules to gather the participants' responses. The authors employed diverse approaches through visitation, telephone calls, and emails to remind participants about the importance of engaging in this survey. After two to three rounds of reminders were sent to the participants, the study received 625, out of which 45 were deemed incomplete responses. The data collection process lasted almost six months (August 2023 to January 2024). The final analysis was evaluated with 580 responses, indicating a response rate of 92.28%.

This study engaged participants with direct experience with GHRM practices, individuals committed to the establishment's green agenda, and those working in an environment that fosters green innovation.

3.4. Analytical approach

This study applied the PLS-SEM because it is well-suited for predictive modeling. It can be used to develop and validate models explaining the link between latent and observed indicators, enabling the study to make predictions and test hypotheses [69]. The PLS-SEM provides insights into the quality of the measurement items and allows for identifying and removing items that do not contribute significantly to the model [70]. Moreover, PLS-SEM allows for integrating different data sources and measurement methods. It can handle both reflective (e.g., Likert scales) and formative (e.g., composite) measurement models, allowing researchers to combine diverse data types in their analysis [71]. In addition, this method is well-suited for exploratory analysis and theory development. It can identify underlying latent dimensions or constructs in a dataset and generate new insights or theories based on the relationships uncovered. It provides various methods for comparing alternative models and evaluating model fit [72].

3.5. Common method bias

Common method bias (CMB) can lead to increased standard errors of regression coefficients, making it difficult to distinguish the specific effects of each predictor variable on the dependent variable. By identifying and handling multicollinearity, the study can obtain more precise and informative interpretations of the interactions between variables. The likelihood of multicollinearity among the studies was therefore investigated using the variance inflation factor (VIF) assessment. The outcomes of this research demonstrate that all of the component's VIF scores of 50% (< 5.00) are below the suggested threshold by Harman [73], proving that the study was free of collinearity and CMB problems. Without accounting for the potential CMB issues with the study dataset, the VIF in this study was 29.37%. Furthermore, steps were taken to mitigate the possible effects of social desirability bias, including informing those participating on the goals of the investigation and guaranteeing their privacy.

4. Results

4.1. Demographic analysis

The sample comprised 58% male and 42% female respondents (see **Table 1**). Regarding firm age, 23% were 1–5 years old, 37% were 6–15 years old, 27% were 16–20, and 13% were more than 20 years old. Educational backgrounds varied, with 24% having a high school education, 50% holding a degree, 14% with a master's, and 12% with a PhD or higher. Job positions were distributed among senior managers (30%), supervisors (44%), and middle-level managers (26%). Respondents represented various industrial sectors: food and beverage (22%), basic iron and steel (16%), petroleum and chemical products (27%), textile and clothing (23%), and

furniture and others (12%). Firm sizes were divided into small (46%) and medium (54%) enterprises.

Table 1. Profile of respondents.

Demographic Indicator	Characteristics	Frequency	Percentage (%)
Gender			
	Male	325	58
	Female	255	42
Age of firm			
	1–5 years	133	23
	6–15 years	216	37
	16–20 years	155	27
	More than 20 years	76	13
Educational Background			
	High School	144	24
	Degree	288	50
	Master	80	14
	PhD and above	68	12
Job Position			
	Senior Manager	178	30
	Supervisor	254	44
	Middle-level Manager	148	26
Industrial Sector			
	Food and Beverage	127	22
	Basic Iron and Steel	95	16
	Petroleum and Chemical Products	160	27
	Textile and Clothing	128	23
	Furniture and Others	70	12
Firm Size			
	Small	268	46
	Medium	312	54

4.2. Convergent validity and reliability of constructs

The paper applied various tests, including Crochbach reliability, Cronbach's alpha, factor loadings, and average extracted variance (AVE). These tests are conducted to examine the internal reliability of the constructs. Manley et al. [74] proposed that the Crochbach reliability, Cronbach's alpha factor loadings, and statistical values should exceed 0.70. As indicated in **Table 2**, the data analysis for the indicators is reliable and valid. Hence, the statistical values of all the constructs were within the recommended threshold, inferring that the scales in this research have internal reliability among the constructs.

Table 2. Outcome of the measurement model.

Indicators	Items	Factor Loadings	Cronbach's alpha ($\alpha > 0.7$)	Composite reliability(ρc) (> 0.7)	AVE (> 0.5)	VIF
GHRM	GHRM1	0.737	0.851	0.869	0.602	1.695
	GHRM2	0.800				2.177
	GHRM3	0.862				2.879
	GHRM4	0.881				1.291
	GHRM5	0.875				1.458
	GHRM6	0.878				
GIC	GIC1	0.722	0.815	0.822	0.528	1.425
	GIC2	0.781				1.015
	GIC3	0.848				2.937
	GIC4	0.876				1.204
	GIC5	0.866				2.293
GOC	GOC1	0.803	0.837	0.944	0.673	2.424
	GOC2	0.848				2.441
	GOC3	0.830				2.260
	GOC4	0.835				2.725
	GOC5	0.873				2.508
LCB	LCB1	0.826	0.851	0.850	0.631	2.664
	LCB2	0.809				1.798
	LCB3	0.784				1.695
	LCB4	0.771				2.177
	LCB5	0.818				2.879
	LCB6	0.844				1.294
	LCB7	0.710				
ENK	ENK1	0.878	0.902	0.915	0.633	1.081
	ENK2	0.891				2.586
	ENK3	0.756				2.941
	ENK4	0.810				2.629
	ENK5	0.803				2.821
EP	EP1	0.813	0.833	0.927	0.589	1.813
	EP2	0.715				1.774
	EP3	0.708				2.837
	EP4	0.878				2.871
	EP5	0.790				1.844

4.3. Discriminant validity

Discriminant validity is a crucial aspect of construct validity, which refers to the extent to which a measurement precisely captures the intended theoretical construct. According to Henseler et al. [75], a study model is considered valid if the structural model constructions fall under the cutoff of 0.90. The study applied the Heterotrait-Monotrait (HTMT) and Fornell and Larcker criterion. The HTMT and Fornell and

Larcker [76] results, as indicated in **Table 3**, demonstrate that the proposed model of this study had good psychometric properties.

Table 3. Results of discriminant validity.

Fornell and Larcker, (1981) Criteria						
	GHRM	GIC	GOC	ENK	LCB	EP
GHRM	0.776					
GIC	0.322	0.632				
GOC	0.637	0.408	0.671			
ENK	0.997	0.329	0.694	0.766		
LCB	0.775	0.369	0.233	0.820	0.795	
EP	0.805	0.132	0.390	0.628	0.649	0.706
HTMT Criteria						
	GHRM	GIC	GOC	ENK	LCB	EP
GHRM						
GIC	0.274					
GOC	0.272	0.474				
ENK	0.176	0.328	0.772			
LCB	0.414	0.115	0.665	0.367		
EP	0.367	0.474	0.702	0.596	0.656	

Note: GHRM: Green HRM; LCB: Low carbon behaviour; GIC: Green innovation climate; GOC: Green organizational commitment.

4.4. Predictive relevance

Table 4. Goodness of fit indices.

Variables	R^2	F^2	Q^2
GHRM	0.502	0.396	0.141
Green innovation climate	0.931	0.472	0.172
Green Organizational Commitment	0.885	0.256	0.254
Environmental Knowledge	0.885	0.748	0.192
Low carbon behaviour	0.631	0.356	0.341
Environmental Performance		0.646	0.397
Model Fitness Indicators	**Saturated Model**	**Estimated Model**	
RMSE	0.030	0.031	
NFI	0.950	0.922	
(RMS_theta)	0.006	0.007	

Note: RMSE: Standardized Root Means Square; NFI: Normal Fit Index test.

Measuring the effective size is an essential complement to testing the significance level (*p*-value) of the relationship among the constructs. Thus, the effective size offers an evaluation technique to measure practical significance in testing the magnitude of the effect among research models. Therefore, this study examines the effect size with a series of tests, which include F^2, R^2, and Q^2. As indicated in **Table 4**, the results from this analysis revealed that all the statistical

coefficients of the F^2, R^2, and Q^2 for the construct range from small to large effect sizes. In addition to these tests, the research explored the goodness of fit through the RMSE, RMS_theta, and NFI. This result verified that the analysis's findings are solid and trustworthy and that policy-makers can base their choices on this study.

4.5. Assessment of structural model

4.5.1. Direct path analysis

The structural model PLS-SEM is a crucial component that allows researchers to examine the relationships between latent constructs and test hypotheses regarding these relationships [74]. This model goes beyond the measurement model and focuses on understanding how latent constructs are interrelated and how they influence each other. The path analysis for this research is structured as follows: Direct, indirect path analysis (mediation), and moderation (iteration) assessment. The analysis proposed six direct connections in the research model. The empirical outcome concluded that GHRM has a direct and substantial influence on GIC H1 (β = 0.695, p-value = 0.001), GOC H2 (β = 0.573, p-value = 0.000), and LCB H3 (β = 0.590, p-value = 0.000). The analysis further revealed that GIC H4 (β = 0.484, p-value = 0.001) has a positive influence on LCB. Likewise, the analysis confirmed that GOC H5 (β = 0.501, p-value = 0.001) has a direct association with LCB. In addition, the study revealed that LCB H6 (β = 0.208, p-value = 0.002) positively affects EP. The result of the structural archetype has been represented in **Figure 2** and **Table 5**.

Table 5. Outcome of path estimates.

Hypothesis	Effect of	Effect on	*β*	*P*-value
H1	GHRM	GIC	0.695***	0.000
H2	GHRM	GOC	0.573***	0.000
H3	GHRM	LCB	0.590***	0.000
H4	GIC	LCB	0.484***	0.000
H5	GOC	LCB	0.501***	0.000
H6	LCB	EP	0.208***	0.002

Note: ***significance level at 1%.

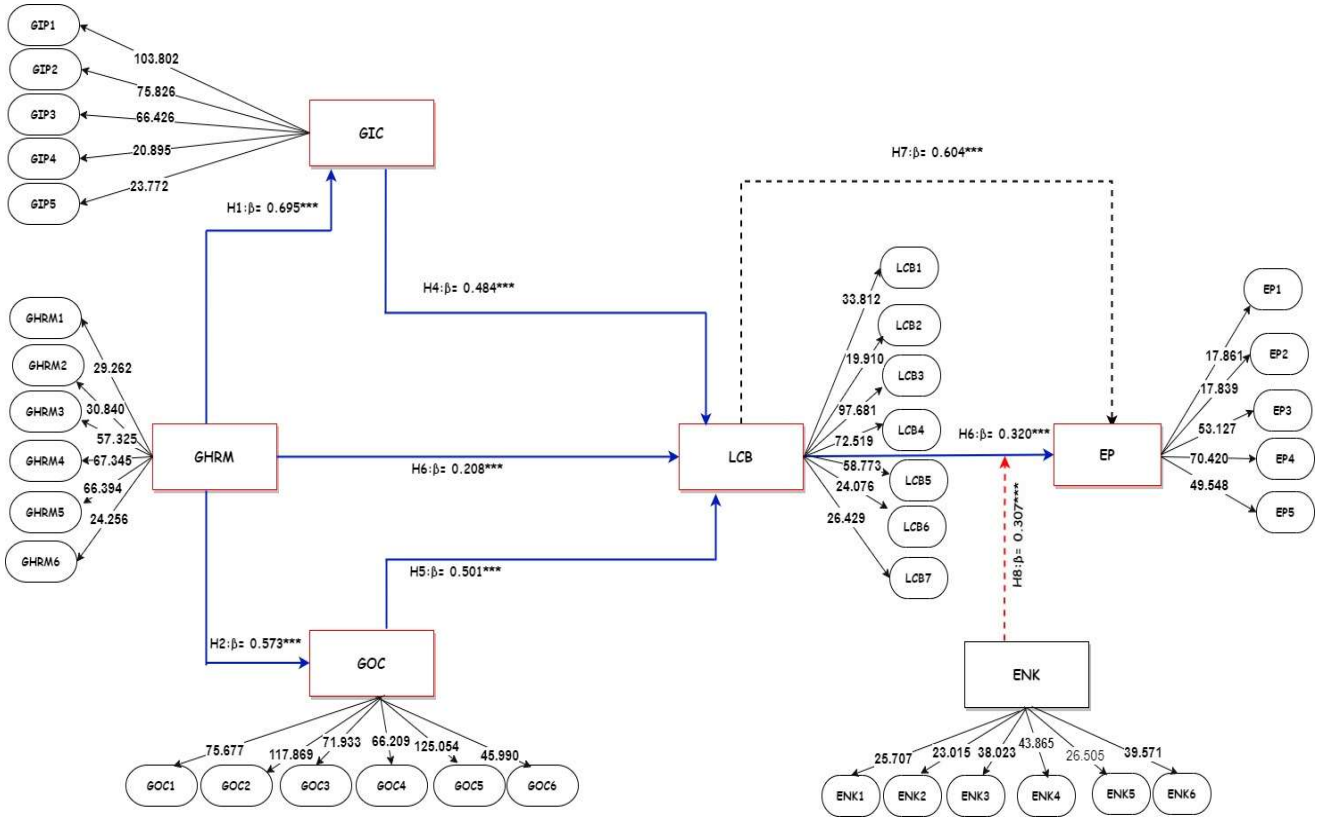

Figure 2. Outcome of the structural model.

4.5.2. Mediation and moderation analysis

The study research explored the mediation effect of LCB on the connection between GHRM and EP. The outcome has been captured in **Table 6**. The empirical findings from the study revealed that the indirect influence of LCB on the nexus between GHRM-LCB was statistically significant (H7) (β = 0.407; t-value = 40.283; p = 0.000). The extrapolation from this outcome indicates that LCB has a significant mediation impact on the GHRM-EP nexus.

Table 6. Estimates for mediation and moderation.

Hypothesis	Relationships	β	*P*-value
H7	LCB → GHRM → EP	0.604***	0.000
H8	ENK*LCB → EP	0.307***	0.000

Note: ***significance level at 1%.

Moreover, the results of the moderation assessment have been provided in **Table 5** and **Figure 3**. The empirical outcome indicated that ENK, H8 (β = 0.307, t = 40.283; p-value = 0.000) has a substantial and positive moderating influence on the association between LCB and EP. The graphical representation of the moderation impact of ENK has been demonstrated in **Figure 3**. The figure indicates that the simultaneous increase of ENK can reduce the strength between LCB and EP.

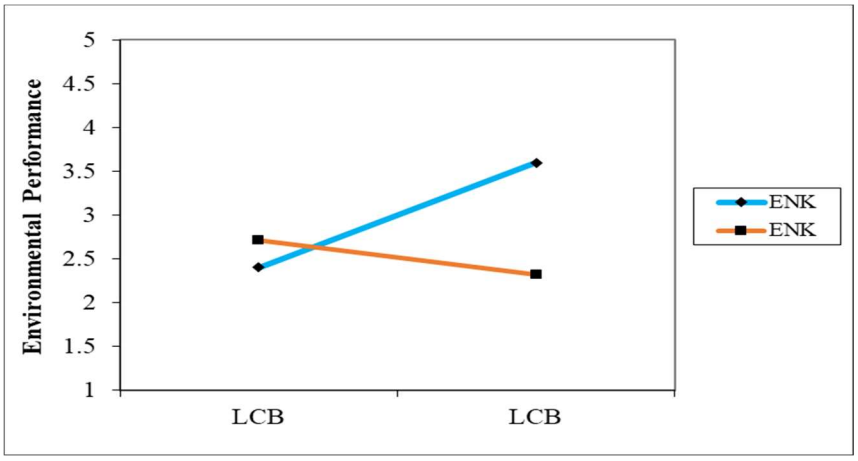

Figure 3. Moderation role of ENK between GHRM and LCB.

5. Discussion

The paper examined the influence of GHRM on GOC, GIC, and LCB on EP. Additionally, the research explored the indirect impact of LCB on the connection between GHRM and LCB. Moreover, the moderate impact of ENK was evaluated. The empirical evidence from the research revealed that GHRM has a favorable influence on GIC, GOC, and LCB, confirming the study's H1–H3 findings. This finding highlighted that GHRM promotes firms' GIC, GOC, and LCB among employees. The possible explanation for this outcome is that SMEs' adoption of GHRM strategies demonstrates the dedication to environmental sustainability, encouraging workers to engage in behaviors that promote ecological stability. The outcome of this study supports existing studies that proved that proper GHRM practices outlined by SMEs significantly impact their level of GOC [19,21,63,77]. As espoused by the AMO theory, the staff's comprehension of the necessity and urgency of adjusting the GHRM system would facilitate the accomplishment of higher-level LCB, GIC, and GOC among employees at the workplace [19]. The results from this investigation imply that GHRM practices improve workers' green motivation, capabilities, and desire to achieve SMEs' green goals. The findings of this study are comparable to erstwhile studies that highlighted that GHRM predicts GIC, GOC, and LCB [78–81].

In addition, the study outcome revealed that GIC substantially influences LCB, supporting the paper's H4. This outcome implies that SMEs can use GIC to proactively outline new standards to strengthen and enhance their LCB [47]. Promoting SMEs' GIC strategies and capacity can provide new approaches and strategic advantages for achieving environmental goals. Moreover, GIC includes the enterprise's ability to integrate green processes and products to produce eco-friendly products with lower energy consumption and a clean atmosphere at the workplace [62,82]. GIC supports responsiveness and efficiency capabilities to government regulations, customer preferences, and societal needs that emphasize the sustainability of the environment [83]. The findings of this investigation align with existing research that emphasizes that SMEs' investment in GIC can help them achieve higher LCB among employees [84–86].

Furthermore, the findings confirmed that GOC substantially influences LCB, implying the fifth hypothesis of this research was supported. The inference from this outcome is that the level of GOC verifies the mechanism and way the workforce is passionately and unequivocally attached to their enterprise. Such practice helps identify whether the staff is willing to engage in LCB. The study's findings reinforce the results by Kim et al. [87] that GOC influences the green behavior of employees in a business. Their study opined that staff with a strong and loyal commitment to their enterprise GOC results in proactive LCB and eco-friendly conduct, enhancing their firms' EP. The present paper confirms that GOC is an essential determinant of individual staff LCB behavior and is congruent with these existing studies [88–90].

This analysis revealed that the LCB of staff directly and substantially interacts with firms' EP, which was confirmed (H6). This outcome proves that if employees indulge themselves in LCB, it affects the environmental performance of SMEs. The interaction between individual action, behavior, and the preservation of the environment is intertwined. Thus, the engagement of workers towards green environmental interventions can be stimulated by the individual LCB, which influences the ecological performance of SMEs. As espoused by prior studies, LCB, such as waste reduction at the workplace, water conservation, reduction in the firm's overall cost, and usage of renewable resources, affects EP [91–93]. Another substantial inference from this study outcome is that the LCB of workers can better bolster environmental management goals.

The paper further assessed the mediation influence of LCB on the linkage between GHRM and EP. This finding supports (H7) of this paper. The implications of this research highlighted that the connection between GHRM and EP can be improved through employees' LCB. Thus, empirical evidence by Channa et al. [94] confirmed that the LCB of employees has an indirect and significant impact on the connection between GHRM and EP. In addition, Ojo et al. [80] proved that GHRM success generally depends on the LCB of employees in Malaysia. Erst while literary works have further pointed out that workers' LCB positively and substantially interacts among GHRM and EP [25,95–98].

Lastly, the findings from the analysis supported the positive moderating impact of ENK on the link between LCB and EP. A possible explanation for this finding implies that a deeper understanding of environmental issues empowers entities to optimize their eco-friendly initiatives, making them more effective in mitigating environmental impact. Essentially, environmental knowledge acts as a catalyst, amplifying the positive impact of LCB on overall EP and reinforcing the notion that informed actions contribute substantially to achieving sustainable outcomes. This nuanced relationship highlights the importance of educational initiatives and awareness campaigns in shaping environmentally conscious behaviors and ultimately driving positive environmental outcomes. The result of the present investigation is consistent with prior studies, which postulated that firms could improve ENK to help promote LCB and EP [9,56].

This study contributes to the overall body of knowledge by providing empirical evidence on the mechanisms through which green human resource management (GHRM), green innovation climate (GIC), and green organizational commitment (GOC) influence low-carbon behavior (LCB) and environmental performance (EP)

in SMEs. By highlighting the mediating role of LCB and the moderating impact of environmental knowledge, this research advances our understanding of how GHRM practices can foster a culture of sustainability and enhance environmental outcomes, particularly in the context of SMEs in emerging markets like China. Additionally, it enriches the application of AMO theory in green workplace practices, demonstrating the importance of employee motivation and organizational climate in achieving sustainability goals.

6. Conclusions and research implications

6.1. Conclusions

International organizations like the United Nations and the recent Glasgow Agreement are championing the need for carbon emissions and preserving the environment for future generations. This call has necessitated the importance of this study, which focuses on low-carbon behavior among employees of SMEs in China. The research hypothesis was evaluated using the SEM-PLS methodology. The research's empirical outcome delineated that GHRM positively influences GIC, GOC, and LCB. Second, the findings captured that GIC and GOC have a substantial and beneficial influence on LCB. Third, the research results discovered that EP can be promoted through LCB. Fourth, the outcomes approved the mediation influence of LCB on the linkage between GHRM and LCB. Fifth, the moderation effect of ENK on the linkage between LCB and EP was supported in this analysis.

6.2. Research implications

6.2.1. Theoretical implications

The theoretical implications of this study lie in its advancement of the AMO theory within the context of sustainability and environmental management in SMEs. This research expands the AMO framework by integrating GHRM as a core component that enhances employees' abilities, motivations, and opportunities to engage in low-carbon behavior. By demonstrating how GHRM practices positively influence GIC, GOC, and low-carbon behavior, this study adds depth to our understanding of how strategic HR practices can drive ecological outcomes. Specifically, it emphasizes that environmental sustainability can be approached through employee-oriented practices focusing on technical training and nurturing. Additionally, this research provides new insights into the mediating role of LCB in linking GHRM with environmental performance and the moderating effect of environmental knowledge, thereby enriching the literature on the complex interactions between organizational resources, employee behaviors, and sustainability outcomes.

Furthermore, the study contributes to the body of knowledge on green innovation by highlighting the role of GIC as a mechanism that empowers SMEs to align their strategic goals with environmental objectives. By illustrating how GIC and GOC can foster proactive low-carbon behavior, the findings provide a theoretical basis for understanding the role of internal organizational climate and commitment in promoting sustainable practices. This research also underscores the

importance of contextual factors, such as firm size and regional characteristics, in shaping the effectiveness of GHRM practices, thereby contributing to the contextualization of the AMO theory in different environmental and economic settings. The study's focus on SMEs in Jiangsu, China, adds to the limited empirical evidence on applying green HR practices in emerging economies, thus offering a valuable perspective that enriches the theoretical discourse on sustainability in diverse organizational contexts.

6.2.2. Practical implications

The practical contributions from the paper are presented as follows: Since the investigation findings demonstrated that GHRM is integral to improving employees' green behavior, the study suggests that organizations should incorporate sustainability principles into their HR policies and procedures. This includes integrating eco-friendly criteria into recruitment and selection processes, emphasizing sustainability-related competencies during employee training and development programs, and establishing performance metrics measuring employee contributions to environmental goals. Again, fostering a culture of sustainability is crucial. Organizations should encourage open communication about sustainability initiatives, promote employee engagement in green teams or environmental projects, and recognize and reward environmentally responsible behaviors.

Considering the relevance and centrality of these concepts (GOC, GIC on LCB), SMEs are expected to provide the needed support to their workforce to enable them to contribute to the business's ecological sustainability plan. In addition, by evaluating the mediation role of LCB between LCB-EP linkage, this study stressed the importance of LCB to SMEs. Hence, as a matter of practical significance, the study recommends that to improve LCB, managers should focus on the green involvement of employees in decisions regarding the environment. Employees' opinions, suggestions, viewpoints, creative ideas, and recommendations can be fostered into firms' environmental management plans. Employees generally show higher commitment and dedication once their firms recognize them and listen to their views regarding the firm's EP actions. Moreover, GHRM managers should outline measures that can empower and involve staff in green issues and help them have autonomy in addressing these challenges. These actions can be instituted under the firm's HRM auspices and captured under these themes (green empowerment and involvement strategies). Providing green feedback to workers on green performance can also be a strategic tool to enhance GOC and GIC.

Lastly, the study results supported the moderate influence of ENK on the interaction between LCB and EP. Hence, this study suggests that senior management and the GHRM section of SMEs should invest in employee training and development associated with ecological stability. In this regard, the GHRM department should educate staff about environmental protection issues, which will assist them in comprehending the firms' environmental policies and improve their understanding of the significance of engaging in LCB at the workplace. Moreover, the awareness and understanding gained through these environmental training activities can help the workforce become more considerate about ecological issues and devise prevention techniques. Thus, employees can be tasked to read about

current carbon emission trends and gather salient information about waste recycling. Once the individual has gained insight into some of these environmental degradation issues, they provide solutions and the necessary steps to mitigate such occurrences.

6.3. Limitations and future direction

While the research gives valuable insights, it is vital to acknowledge certain limitations. Firstly, the study might face challenges in generalizability due to its potential to concentrate on particular businesses or organizational contexts. Future studies could also explore how GHRM practices translate into tangible low-carbon outcomes, exploring employee perceptions and behaviors. Furthermore, investigating the potential moderating effects of external factors, such as regulatory environments or industry characteristics, would enhance understanding of the complexities of fostering sustainable organizational behavior. Another limitation of this study is the lack of a multi-group analysis to examine potential differences between small and medium-sized firms. Future research should consider conducting such an analysis to explore whether firm size influences the relationships within the investigated model. Lastly, exploring the role of technology and digital innovation in promoting green practices could be a promising avenue for future research, as technological advancements increasingly play a pivotal role in shaping organizational sustainability efforts.

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References

1. Amin A, Dogan E. The role of economic policy uncertainty in the energy-environment nexus for China: Evidence from the novel dynamic simulations method. Journal of Environmental Management. 2021; 292: 112865. doi: 10.1016/j.jenvman.2021.112865
2. Liu H, Zafar MW, Sinha A, et al. The path to sustainable environment: Do environmental taxes and governance matter? Sustainable Development. 2023; 31(4): 2278-2290. doi: 10.1002/sd.2505
3. Wiredu J, Yang Q, Sampene AK, et al. The Effect of Green Supply Chain Management Practices on Corporate Environmental Performance: Does Supply Chain Competitive Advantage Matter? SSRN Electronic Journal. 2023. doi: 10.2139/ssrn.4599705
4. Wiredu J, Yang Q, Saljoughipour S, et al. Stimulating environmental performance through green human resource practice: Does green transformational leadership matter? Journal of Infrastructure, Policy and Development. 2023; 7(1): 2127. doi: 10.24294/jipd.v7i1.2127
5. Subramanian N, Suresh M. Green organizational culture in manufacturing SMEs: an analysis of causal relationships. International Journal of Manpower. 2023; 44(5): 789-809. doi: 10.1108/ijm-09-2021-0557
6. Piwowar-Sulej K, Kołodziej I. Organizational practices promoting employees' pro-environmental behaviors in a Visegrad Group country: How much does company ownership matter? PLOS ONE. 2022; 17(2): e0261547. doi: 10.1371/journal.pone.0261547
7. Niazi UI, Nisar QA, Nasir N, et al. Green HRM, green innovation and environmental performance: the role of green transformational leadership and green corporate social responsibility. Environmental Science and Pollution Research. 2023; 30(15): 45353-45368. doi: 10.1007/s11356-023-25442-6

8. Veerasamy U, Joseph MS, Parayitam S. Green Human Resource Management and Employee Green Behavior: Participation and Involvement, and Training and Development as Moderators. South Asian J. Hum. Resour. Manag. 2023. doi: 10.24294/jipd.v7i1.2127
9. Khan SAR, Ahmad Z, Sheikh AA, et al. Green technology adoption paving the way toward sustainable performance in circular economy: a case of Pakistani small and medium enterprises. International Journal of Innovation Science. 2023; 16(5): 801-822. doi: 10.1108/ijis-10-2022-0199
10. Tjahjadi B, Soewarno N, Mustikaningtiyas F. Good corporate governance and corporate sustainability performance in Indonesia: A triple bottom line approach. Heliyon. 2021; 7(3): e06453. doi: 10.1016/j.heliyon.2021.e06453
11. Han H, Hyun SS. Fostering customers' pro-environmental behavior at a museum. Journal of Sustainable Tourism. 2016; 25(9): 1240-1256. doi: 10.1080/09669582.2016.1259318
12. Rahman I, Reynolds D. Predicting green hotel behavioral intentions using a theory of environmental commitment and sacrifice for the environment. International Journal of Hospitality Management. 2016; 52: 107-116. doi: 10.1016/j.ijhm.2015.09.007
13. Amoah A, Addoah T. Does environmental knowledge drive pro-environmental behavior in developing countries? Evidence from households in Ghana. Environment, Development and Sustainability. 2020; 23(2): 2719-2738. doi: 10.1007/s10668-020-00698-x
14. Cheng KW, Osman S, Jusoh ZM, et al. The Significant Relationships Between Attitude, Descriptive Norm, Injunctive Norm, Environmental Knowledge, And Households' Intention to Practise Solid Waste Segregation-At-Source. Resmilitaris. 2023; 13: 1470-1481.
15. Liobikienė G, Poškus MS. The Importance of Environmental Knowledge for Private and Public Sphere Pro-Environmental Behavior: Modifying the Value-Belief-Norm Theory. Sustainability. 2019; 11(12): 3324. doi: 10.3390/su11123324
16. Sigit DV, Azrai EP, Suryanda A, et al. Students' Knowledge, Awareness, and Pro-Environmental Behavior in Urban to Design Climate Change Book Serials. Journal of People, Plants, and Environment. 2021; 24(5): 509-517. doi: 10.11628/ksppe.2021.24.5.509
17. Appelbaum E, Bailey T, Berg P, et al. Manufacturing Advantage: Why High-Performance Work Systems Pay Off. Cornell University Press; 2000.
18. Karmoker K, Kona FA, Oyshi AH, et al. Effects of Green Human Resource Management on Employee Green Behavior: Moderating Role of Employee Environmental Knowledge. International Journal of Sustainable Development & World Policy. 2021; 10(2): 64-80. doi: 10.18488/journal.26.2021.102.64.80
19. Shoaib M, Abbas Z, Yousaf M, et al. The role of GHRM practices towards organizational commitment: A mediation analysis of green human capital. Cogent Business & Management. 2021; 8(1). doi: 10.1080/23311975.2020.1870798
20. Barney J, Wright M, Ketchen DJ. The resource-based view of the firm: Ten years after 1991. Journal of Management. 2001; 27(6): 625-641. doi: 10.1177/014920630102700601
21. Amjad F, Abbas W, Zia-UR-Rehman M, et al. Effect of green human resource management practices on organizational sustainability: the mediating role of environmental and employee performance. Environmental Science and Pollution Research. 2021. doi: 10.1007/s11356-020-11307-9
22. Aslam S, Elmagrhi MH, Rehman RU, et al. Environmental management practices and financial performance using data envelopment analysis in Japan: The mediating role of environmental performance. Business Strategy and the Environment. 2020; 30(4): 1655-1673. doi: 10.1002/bse.2700
23. Aidara S, Mamun AA, Nasir NAM, et al. Competitive Advantages of the Relationship between Entrepreneurial Competencies and Economic Sustainability Performance. Sustainability. 2021; 13(2): 864. doi: 10.3390/su13020864
24. Elshaer IA, Azazz AMS, Fayyad S. Green Management and Sustainable Performance of Small- and Medium-Sized Hospitality Businesses: Moderating the Role of an Employee's Pro-Environmental Behavior. International Journal of Environmental Research and Public Health. 2023; 20(3): 2244. doi: 10.3390/ijerph20032244
25. Jamshed S, Naz S, Ali Q, et al. Psychological Green Climate and pro-Environmental Behaviors: An Efficacious Drive towards Environmental Performance in China. Curr. Psychol. 2021; 1-16.
26. Ansari NY, Farrukh M, Raza A. Green human resource management and employees pro-environmental behaviors: Examining the underlying mechanism. Corporate Social Responsibility and Environmental Management. 2020; 28(1): 229-238. doi: 10.1002/csr.2044

27. Shah N, Soomro BA. Effects of Green Human Resource Management Practices on Green Innovation and Behavior. Manag. Decis. 2023; 61: 290-312. doi:10.1108/MD-07-2021-0869/FULL/XML
28. Meng J, Murad M, Li C, et al. Green Lifestyle: A Tie between Green Human Resource Management Practices and Green Organizational Citizenship Behavior. Sustainability. 2022; 15(1): 44. doi: 10.3390/su15010044
29. Guo Y, Wang L, Chen Y. Green Entrepreneurial Orientation and Green Innovation: The Mediating Effect of Supply Chain Learning. Sage Open. 2020; 10(1). doi: 10.1177/2158244019898798
30. Meirun T, Makhloufi L, Ghozali Hassan M. Environmental Outcomes of Green Entrepreneurship Harmonization. Sustainability. 2020; 12(24): 10615. doi: 10.3390/su122410615
31. Sampene AK, Li C, Khan A, et al. Yes! I want to be an entrepreneur: A study on university students' entrepreneurship intentions through the theory of planned behavior. Current Psychology. 2022; 42(25): 21578-21596. doi: 10.1007/s12144-022-03161-4
32. Owusu EA, Zhou L, Kwasi Sampene A, et al. Fostering Environmental Performance Via Corporate Social Responsibility and Green Innovation Initiatives: Examining the Moderating Influence of Competitive Advantage. Sage Open. 2024; 14(2). doi: 10.1177/21582440241242847
33. Cao H, Chen Z. The driving effect of internal and external environment on green innovation strategy-The moderating role of top management's environmental awareness. Nankai Business Review International. 2019; 10(3): 342-361. doi: 10.1108/nbri-05-2018-0028
34. Wu F, Cui D, Yang FH. To learn or to have fun? How paratexts of entertainment education programs affect fans' informal learning. Chinese Journal of Communication. 2023; 17(2): 206-225. doi: 10.1080/17544750.2023.2253333
35. Fazal-e-Hasan SM, Ahmadi H, Sekhon H, et al. The role of green innovation and hope in employee retention. Business Strategy and the Environment. 2022; 32(1): 220-239. doi: 10.1002/bse.3126
36. Siregar ZME, Sujana FR, Pranowo AS, Supriadi YN. Job Autonomy and Innovative Work Behavior of Marketing Employees in the Automotive Industry in Indonesia: The Mediating Role of Organizational Commitment. Calitatea. 2021; 22: 97-102.
37. Sarmad M, Pirzada MA, Iqbal R. Fostering extra-role green behavior through green HRM practices: mediating role of green absorptive capacity. International Journal of Manpower. 2023; 44(8): 1535-1552. doi: 10.1108/ijm-10-2021-0592
38. Wang Y, Wang F, Sang P, et al. Analyzing factors affecting developers' behavior towards the adoption of prefabricated buildings in China. Environment, Development and Sustainability. 2021; 23(10): 14245-14263. doi: 10.1007/s10668-021-01265-8
39. Maydiantoro A, Tusianah R, Isnainy UCAS, et al. A Literature Review of the Three Elements of Organizational Commitment: The Meaning of the Contribution Score Average. Wseas transactions on business and economics. 2021; 18: 679-689. doi: 10.37394/23207.2021.18.67
40. Meyer JP, Stanley DJ, Herscovitch L, et al. Affective, Continuance, and Normative Commitment to the Organization: A Meta-analysis of Antecedents, Correlates, and Consequences. Journal of Vocational Behavior. 2002; 61(1): 20-52. doi: 10.1006/jvbe.2001.1842
41. Raza SA, Khan KA. Impact of green human resource practices on hotel environmental performance: the moderating effect of environmental knowledge and individual green values. International Journal of Contemporary Hospitality Management. 2022; 34(6): 2154-2175. doi: 10.1108/ijchm-05-2021-0553
42. Fatima M, Izhar Z, Kazmi ZA. Organizational Justice and Employee Sustainability: The Mediating Role of Organizational Commitment. SEISENSE Journal of Management. 2020; 3(3): 12-22. doi: 10.33215/sjom.v3i3.334
43. Darvishmotevali M, Altinay L. Green HRM, environmental awareness and green behaviors: The moderating role of servant leadership. Tourism Management. 2022; 88: 104401. doi: 10.1016/j.tourman.2021.104401
44. Nisar S, Khan NR, Khan MR. Determinant analysis of employee attitudes toward pro-environmental behavior in textile firms of Pakistan: a serial mediation approach. Management of Environmental Quality: An International Journal. 2021; 32(5): 1064-1094. doi: 10.1108/meq-11-2020-0270
45. Saeed BB, Afsar B, Hafeez S, et al. Promoting employee's proenvironmental behavior through green human resource management practices. Corporate Social Responsibility and Environmental Management. 2018; 26(2): 424-438. doi: 10.1002/csr.1694
46. Small A, Russell SV, Paavola J. Corporate Environmental Sustainability and Ecosystem Services: A 21st Century Solution? Academy of Management Proceedings. 2019; 2019(1): 12858. doi: 10.5465/ambpp.2019.239

47. Sampene AK, Li C, Oteng Agyeman F, et al. Employees' behavioral action towards corporate environmental performance: The moderating effect of moral reflectiveness. Heliyon. 2024; 10(6): e28075. doi: 10.1016/j.heliyon.2024.e28075
48. Syafri W, Prabowo H, Ashari NURS, Muafi M. The Impact of Workplace Green Behavior and Green Innovation on Green Performance of SMEs: A Case Study in Indonesia. J. Asian Financ. 2021; 8: 365-0374. doi:10.13106/jafeb.2021.vol8.no5.0365
49. Ming Y, Deng H, Wu X. The negative effect of air pollution on people's pro-environmental behavior. Journal of Business Research. 2022; 142: 72-87. doi: 10.1016/j.jbusres.2021.12.044
50. Kim M, Lee SM. Drivers and interrelationships of three types of pro-environmental behaviors in the workplace. International Journal of Contemporary Hospitality Management. 2022; 34(5): 1854-1881. doi: 10.1108/ijchm-09-2021-1094
51. Han H, Moon H, Hyun SS. Uncovering the determinants of pro-environmental consumption for green hotels and green restaurants. International Journal of Contemporary Hospitality Management. 2019; 32(4): 1581-1603. doi: 10.1108/ijchm-04-2019-0354
52. Tan Pham N, Tučková Z, Phu Thi Phan Q. Sectoral analysis of the effectiveness of bank risk capital in the visegrad group countries. Journal of Business Economics and Management. 2019; 20(3): 446-465. doi: 10.3846/jbem.2019.9659
53. Khan A, Hussain S, Sampene AK. Investing in green intellectual capital to enhance green corporate image under the Influence of green innovation climate: A Case of Chinese Entrepreneurial SMEs. Journal of Cleaner Production. 2023; 418: 138177. doi: 10.1016/j.jclepro.2023.138177
54. Riva F, Magrizos S, Rubel MRB. Investigating the link between managers' green knowledge and leadership style, and their firms' environmental performance: The mediation role of green creativity. Business Strategy and the Environment. 2021; 30(7): 3228-3240. doi: 10.1002/bse.2799
55. Paço A, Lavrador T. Environmental knowledge and attitudes and behaviors towards energy consumption. Journal of Environmental Management. 2017; 197: 384-392. doi: 10.1016/j.jenvman.2017.03.100
56. Rafiq F, Chishty SK, Adil M. Explanatory or Dispositional Optimism: Which Trait Predicts Eco-Friendly Tourist Behavior? Sustainability. 2022; 14(5): 2994. doi: 10.3390/su14052994
57. Cheng Y, Liu H, Yuan Y, et al. What Makes Employees Green Advocates? Exploring the Effects of Green Human Resource Management. International Journal of Environmental Research and Public Health. 2022; 19(3): 1807. doi: 10.3390/ijerph19031807
58. Halis M, Halis M. Impact of energy management systems, pro-environmental energy consumption, and awareness on performance outcomes: a serial mediated-moderated modeling with PLS-SEM. Environmental Science and Pollution Research. 2021; 29(18): 26910-26921. doi: 10.1007/s11356-021-17867-8
59. Ashraf SF, Li C, Wattoo MU, et al. Green horizons: Unleashing green innovation through green business strategies and competencies. Business Strategy and the Environment. 2024; 33(5): 4233-4251. doi: 10.1002/bse.3696
60. Ren S, Jiang K, Tang G. Leveraging green HRM for firm performance: The joint effects of CEO environmental belief and external pollution severity and the mediating role of employee environmental commitment. Human Resource Management. 2021; 61(1): 75-90. doi: 10.1002/hrm.22079
61. Fatoki O. Environmental Orientation and Green Competitive Advantage of Hospitality Firms in South Africa: Mediating Effect of Green Innovation. Journal of Open Innovation: Technology, Market, and Complexity. 2021; 7(4): 223. doi: 10.3390/joitmc7040223
62. Makhloufi L, Laghouag AA, Meirun T, et al. Impact of green entrepreneurship orientation on environmental performance: The natural resource-based view and environmental policy perspective. Business Strategy and the Environment. 2021; 31(1): 425-444. doi: 10.1002/bse.2902
63. Iqbal S, Akhtar S, Anwar F, et al. Linking green innovation performance and green innovative human resource practices in SMEs; a moderation and mediation analysis using PLS-SEM. Current Psychology. 2021; 42(13): 11250-11267. doi: 10.1007/s12144-021-02403-1
64. Lange F. Behavioral paradigms for studying pro-environmental behavior: A systematic review. Behavior Research Methods. 2022; 55(2): 600-622. doi: 10.3758/s13428-022-01825-4
65. Shehzad MU, Zhang J, Latif KF, et al. Do green entrepreneurial orientation and green knowledge management matter in the pursuit of ambidextrous green innovation: A moderated mediation model. Journal of Cleaner Production. 2023; 388: 135971. doi: 10.1016/j.jclepro.2023.135971

66. Úbeda-García M, Marco-Lajara B, Zaragoza-Sáez PC, et al. Green ambidexterity and environmental performance: The role of green human resources. Corporate Social Responsibility and Environmental Management. 2021; 29(1): 32-45. doi: 10.1002/csr.2171
67. Park YS, Konge L, Artino AR. The Positivism Paradigm of Research. Academic Medicine. 2020; 95(5): 690-694. doi: 10.1097/acm.0000000000003093
68. Miller R, Brewer J. Sampling, Snowball: Accessing Hidden and Hard-to-Reach Populations. AZ Soc. Res. A Dict. key Soc. Sci. Res. Concepts. 2003; 274.
69. Hair JF, Howard MC, Nitzl C. Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. Journal of Business Research. 2020; 109: 101-110. doi: 10.1016/j.jbusres.2019.11.069
70. Ma Z, Oteng Agyeman F, Kwasi Sampene A, et al. Senior High School Teachers' Preference for Professional Development: A Case Study in the Central Region of Ghana Under the Current Free Senior High School Policy. Sage Open. 2023; 13(3). doi: 10.1177/21582440231185116
71. Sampene AK, Li C, Wiredu J, et al. Examining the nexus between social cognition, biospheric values, moral norms, corporate environmental responsibility and pro-environmental behavior. Does environmental knowledge matter? Current Psychology. 2023; 43(7): 6549-6569. doi: 10.1007/s12144-023-04832-6
72. Cai L, Kwasi Sampene A, Khan A, et al. Does Entrepreneur Moral Reflectiveness Matter? Pursing Low-Carbon Emission Behavior among SMEs through the Relationship between Environmental Factors, Entrepreneur Personal Concept, and Outcome Expectations. Sustainability. 2022; 14(2): 808. doi: 10.3390/su14020808
73. Harman HH. Modern Factor Analysis. University of Chicago Press; 1976.
74. Manley SC, Hair JF, Williams RI, et al. Essential new PLS-SEM analysis methods for your entrepreneurship analytical toolbox. International Entrepreneurship and Management Journal. 2020; 17(4): 1805-1825. doi: 10.1007/s11365-020-00687-6
75. Henseler J, Ringle CM, Sarstedt M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science. 2014; 43(1): 115-135. doi: 10.1007/s11747-014-0403-8
76. Fornell C, Larcker DF. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. Journal of Marketing Research. 1981; 18(1): 39. doi: 10.2307/3151312
77. Elshaer IA, Sobaih AEE, Aliedan M, et al. The Effect of Green Human Resource Management on Environmental Performance in Small Tourism Enterprises: Mediating Role of Pro-Environmental Behaviors. Sustainability. 2021; 13(4): 1956. doi: 10.3390/su13041956
78. Aboramadan M, Kundi YM, Becker A. Green Human Resource Management in Nonprofit Organizations: Effects on Employee Green Behavior and the Role of Perceived Green Organizational Support. Pers. Rev. 2021. doi:10.1108/PR-02-2021-0078/FULL/XML
79. Fawehinmi O, Yusliza MY, Wan Kasim WZ, et al. Exploring the Interplay of Green Human Resource Management, Employee Green Behavior, and Personal Moral Norms. Sage Open. 2020; 10(4). doi: 10.1177/2158244020982292
80. Ojo AO, Tan CNL, Alias M. Linking green HRM practices to environmental performance through pro-environment behavior in the information technology sector. Social Responsibility Journal. 2020; 18(1): 1-18. doi: 10.1108/srj-12-2019-0403
81. Mohiuddin M, Hosseini E, Faradonbeh SB, et al. Achieving Human Resource Management Sustainability in Universities. International Journal of Environmental Research and Public Health. 2022; 19(2): 928. doi: 10.3390/ijerph19020928
82. Sampene AK, Li C, Esther Agyeiwaa O. Green human resource to stimulate low carbon behavior through the mediation role of innovation practices and organizational commitment. International Journal of Innovation Studies. 2024; 8(4): 364-380. doi: 10.1016/j.ijis.2024.09.001
83. Qing L, Chun D, Dagestani AA, et al. Does Proactive Green Technology Innovation Improve Financial Performance? Evidence from Listed Companies with Semiconductor Concepts Stock in China. Sustainability. 2022; 14(8): 4600. doi: 10.3390/su14084600
84. Song S, Hossin MA, Yin X, et al. Accelerating Green Innovation Performance from the Relations of Network Potential, Absorptive Capacity, and Environmental Turbulence. Sustainability. 2021; 13(14): 7765. doi: 10.3390/su13147765
85. Sun D, Kyere F, Sampene AK, et al. An investigation on the role of electric vehicles in alleviating environmental pollution: evidence from five leading economies. Environmental Science and Pollution Research. 2022; 30(7): 18244-18259. doi: 10.1007/s11356-022-23386-x

86. Weng HH, Chen JS, Chen PC. Effects of Green Innovation on Environmental and Corporate Performance: A Stakeholder Perspective. Sustainability. 2015; 7(5): 4997-5026. doi: 10.3390/su7054997
87. Kim YJ, Kim WG, Choi HM, et al. The effect of green human resource management on hotel employees' eco-friendly behavior and environmental performance. International Journal of Hospitality Management. 2019; 76: 83-93. doi: 10.1016/j.ijhm.2018.04.007
88. MacInnes S, Grün B, Dolnicar S. Habit drives sustainable tourist behavior. Annals of Tourism Research. 2022; 92: 103329. doi: 10.1016/j.annals.2021.103329
89. Wasaya A, Saleem MA, Ahmad J, et al. Impact of green trust and green perceived quality on green purchase intentions: a moderation study. Environment, Development and Sustainability. 2021; 23(9): 13418-13435. doi: 10.1007/s10668-020-01219-6
90. Saleem M, Qadeer F, Mahmood F, et al. Inculcation of Green Behavior in Employees: A Multilevel Moderated Mediation Approach. International Journal of Environmental Research and Public Health. 2021; 18(1): 331. doi: 10.3390/ijerph18010331
91. Shahzad M, Qu Y, Zafar AU, et al. Does the interaction between the knowledge management process and sustainable development practices boost corporate green innovation? Business Strategy and the Environment. 2021; 30(8): 4206-4222. doi: 10.1002/bse.2865
92. Latif B, Ong TS, Meero A, et al. Employee-Perceived Corporate Social Responsibility (CSR) and Employee Pro-Environmental Behavior (PEB): The Moderating Role of CSR Skepticism and CSR Authenticity. Sustainability. 2022; 14(3): 1380. doi: 10.3390/su14031380
93. Shao X, Zhong Y, Liu W, et al. Modeling the effect of green technology innovation and renewable energy on carbon neutrality in N-11 countries? Evidence from advance panel estimations. Journal of Environmental Management. 2021; 296: 113189. doi: 10.1016/j.jenvman.2021.113189
94. Channa NA, Tariq B, Samo AH, et al. Predicting consumers' intentions to purchase eco-friendly athletic wear in a moderated model of individual green values and gender. International Journal of Sports Marketing and Sponsorship. 2021; 23(2): 410-436. doi: 10.1108/ijsms-12-2020-0215
95. Anwar N, Nik Mahmood NH, Yusliza MY, et al. Green Human Resource Management for organisational citizenship behaviour towards the environment and environmental performance on a university campus. Journal of Cleaner Production. 2020; 256: 120401. doi: 10.1016/j.jclepro.2020.120401
96. Elshaer IA, Azazz AMS, Fayyad S. Green Human Resources and Innovative Performance in Small- and Medium-Sized Tourism Enterprises: A Mediation Model Using PLS-SEM Data Analysis. Mathematics. 2023; 11(3): 711. doi: 10.3390/math11030711
97. Jeong Y, Kim SK, Yu JG. Determinants of Behavioral Intentions in the Context of Sport Tourism with the Aim of Sustaining Sporting Destinations. Sustainability. 2019; 11(11): 3073. doi: 10.3390/su11113073
98. Pham NT, Vo Thanh T, Tučková Z, et al. The role of green human resource management in driving hotel's environmental performance: Interaction and mediation analysis. International Journal of Hospitality Management. 2020; 88: 102392. doi: 10.1016/j.ijhm.2019.102392

Appendix

Construct	Item Code	Items	Source
GHRM	GHRM1	At our enterprise, environmental issues are a necessity for job descriptions.	Ren et al. [60]; Bin Saeed et al. [45]
	GHRM2	My firm chooses candidates sufficiently knowledgeable about greening to fill open positions.	
	GHRM3	Recruitment communications incorporate environmental commitment and conduct requirements.	
	GHRM4	This firm establishes an environment management system and environmental audit.	
	GHRM5	Our enterprise engages the employees in establishing environmental strategies.	
	GHRM6	Our firm recognizes employees as essential actors in environmental decisions and initiatives.	
GIC	GIC1	Our enterprise has enhanced environmentally friendly packaging for both used and new products.	Fatoki [61]; Makhloufi et al. [62]
	GIC2	Our enterprise produces goods and offers services while taking ecological considerations into mind.	
	GIC3	Our enterprise uses modern technology to neutralize pollution.	
	GIC4	Our enterprise uses repurposed and recycled materials when providing services to consumers.	
	GIC5	Our enterprise uses less material when providing services to clients.	
GOC	GOC1	I have an emotional attachment to the environmental goals of my enterprise.	Iqbal et al. [63]
	GOC2	I have a stronger sense of responsibility for the environmental goals of my enterprise.	
	GOC3	I feel ethically bound to support this enterprise's ecological goals, which is one of the reasons I will not leave this firm to work elsewhere.	
	GOC4	Despite a better employment opportunity from another firm, I wouldn't think it was appropriate to leave my current employer because of its commitment to the environment.	
	GOC5	Many of my career would be disrupted if I decided I wanted to quit my job immediately because I identify with its environmental obligations.	
LCB	LCB1	I take part in eco-initiatives at the workplace.	Lange [64]; Bin Saeed et al. [45]
	LCB2	I educate and share knowledge about environmental issues with my co-workers.	
	LCB3	I generate various proposals for procedures to help my company operate better regarding environmental sustainability.	
	LCB4	I enjoy being mindful of turning off technological devices to save energy.	
	LCB5	I use ecologically friendly methods to complete jobs that are required of me.	
	LCB6	I enjoy being mindful of turning off technological devices to save energy.	
	LCB7	I appreciate recycling and practicing energy efficiency.	
ENK	ENK1	I am aware of the issue of chemical-issued industrial contamination.	Karmoker et al. [18]; Usman et al. [65]
	ENK2	I have a thorough understanding of environmental issues.	
	ENK3	I am constantly mindful of how the environment is degrading.	
	ENK4	I know how to prevent pollution from putting the environment in danger.	
	ENK5	I am knowledgeable about environmental climate.	
EP	EP1	Our enterprise minimizes the influence of its products and procedures on the environment.	Ubeda-Garcia et al. [66]
	EP2	Our firm has switched to a renewable power source and reduced its fossil fuel use.	
	EP3	Our enterprise has drastically decreased the amount of solid waste it produces.	
	EP4	The current business operations of our firm are automated.	
	EP5	Our business uses ecologically friendly methods to dispose of waste.	