DETERMINANTS OF EMPLOYEE GREEN BEHAVIOR IN HEALTHCARE SECTOR: EVIDENCE FROM FACILITIES IN HANOI

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Abstract

Research purpose:

The purpose of this research is to explore the determinants of employee green behavior in the healthcare sector, with a focus on the roles of environmental knowledge (EK), environmental attitude (EA), and green human resource management (GHRM). Both in-role and extra-role green behaviors are analyzed to to gain a broad perspective on how employees engage in environmentally responsible practices in the workplace.

Research motivation:

While the healthcare sector is a significant contributor to environmental impacts,

Although healthcare services generate considerable environmental impacts, studies on employees' eco-friendly practices within this sector remain scarce, especially in the Vietnamese context. This study addresses this gap by exploring how individual-level and organizational-level factors jointly influence sustainable workplace practices.

Research design, approach, and method:

Drawing on the Theory of Planned Behavior and Social Exchange Theory, an integrated framework was proposed. Survey data from 203 healthcare employees in Hanoi using a structured questionnaire and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM).

Main findings:

EA emerged as the most influential predictor of both in-role and extra-role green behaviors. EK influenced these behaviors through both direct and mediated pathways, with its effect being stronger when transmitted via EA. GHRM practices significantly promoted green behavior, particularly in in-role actions.

Practical/managerial implications:

The results emphasize the need for healthcare organizations to simultaneously strengthen employees' environmental knowledge, foster positive environmental attitudes, and implement supportive GHRM practices. Such a dual focus on individual cognition and organizational systems can effectively cultivate a green culture within healthcare institutions.

Keywords: Environmental knowledge, Environmental attitude, Green HRM, Green behavior, Healthcare sector.

1. INTRODUCTION

Environmental pollution in Vietnam has reached alarming levels, particularly in areas with high concentrations of economic and social activities. According to the World Bank, air and environmental pollution in Vietnam lead to annual economic losses amounting to approximately 5% of the country's GDP (Tuấn Hà, 2021). In response, sustainability and environmentally friendly measures have become an urgent priority across various economic sectors. Organizations across various sectors are increasingly striving to contribute to sustainable development and lead society toward a more ecologically responsible future. Within this movement, healthcare institutions hold a particularly crucial role due to their significant influence on communities. These institutions not only provide essential healthcare services but also consume substantial energy and resources, generating considerable waste in the process.

Given the nature of the healthcare sector, hospitals and clinics require large quantities of electricity, water, and disinfectant chemicals, while simultaneously producing significant amounts of medical waste, including plastics, pharmaceuticals, and biological materials. As a result, promoting environmentally friendly workplace practices in this sector is critical. Employee green behavior (EGB) is increasingly recognized as an active means to enhance environmental sustainability and address ecological challenges, attracting increasing interest from researchers and organizations alike. Recent research on EGB has shifted the lens of sustainability management from an organization-wide perspective to the individual level, highlighting the critical role that employees play in advancing environmental initiatives and sustainability outcomes (Ababneh, 2021).

Later studies have investigated different dimensions of employee green initiatives (Chen & Chang, 2014) examined factors influencing their frequency (Yuriev et al., 2020), and highlighted their wider implications for organizational performance that extend beyond purely environmental outcomes (Shahzad et al., 2023). However, despite growing recognition during the past two decades, studies concerning EGB remains fragmented, particularly in the healthcare sector. While EGB has been examined across diverse fields such as engineering, tourism, ecology, management, and psychology have investigated EGB, studies in the healthcare sector remain limited. This gap is even more pronounced in Vietnam, where research on employee green behavior in healthcare institutions remains scarce. As a result, there is a pressing need for further exploration to understand the key factors driving EGB in Vietnam's healthcare sector.

Despite this growing attention, limited research has explicitly examined the joint roles of healthcare employees and employers in promoting green behavior. Employees, as frontline actors, directly determine whether eco-friendly practices are carried out in daily medical routines, while employers shape the organizational environment by providing policies, training, and incentives that enable such practices. Without the combined efforts of both groups, sustainability strategies in healthcare institutions are unlikely to succeed. This gap highlights the importance of analyzing how individual - level factors (e.g., environmental knowledge and attitudes) interact with organizational-level practices (e.g., green HRM policies) to shape employee green behavior. In the Vietnamese healthcare context, where high resource consumption and waste generation are critical issues, such an examination is particularly urgent to ensure sustainability is embedded in the working environment.

In this context, the green behavior of healthcare employees, defined as their willingness to adopt workplace actions that contribute to environmental protection, plays a vital role in minimizing negative environmental impacts. Encouraging sustainable behavior among healthcare professionals is essential to fostering eco-friendly practices within medical institutions. In Hanoi, the capital of Vietnam and a rapidly growing urban center, environmental challenges such as air pollution and medical waste management pose significant concerns (Dang et al., 2021). Therefore, understanding the key factors influencing EGB in Hanoi's healthcare sector is crucial for designing effective strategies to promote such behaviors. This research aims to identify these determinants, providing practical guidance for healthcare managers and policymakers aiming to enhance environmental sustainability in medical institutions.

2. THEORETICAL FOUNDATION

2.1. Green Employee Behavior

Green Employee Behavior (EGB) refers to actions undertaken by employees to reduce environmental impact and support sustainability goals (Dubois and Debois, 2012; Sabokro et al., 2021). While early studies emphasized voluntary actions, later research by Norton et al. (2014) highlighted that EGB includes both required and self-initiated behaviors. Based on this view, EGB is categorized into two forms. In-role green behavior describes environmentally conscious practices that are integrated into employees' formal job responsibilities, such as conserving energy and complying with environmental policies (Bissing-Olson et al., 2013; Chaudhary, 2020). Extra role green behavior involves voluntary efforts that exceed formal job expectations, including suggesting eco-friendly initiatives and identifying environmental inefficiencies (Frese &Fay, 2001).

This study adopts the framework of Norton et al. (2014) and Chaudhary (2020), defining EGB as a composite of both in-role and extra-role behaviors aimed at reducing environmental harm and promoting sustainability within organizations. By examining the determinants of both task-related and proactive green behaviors, The study aims to advance understanding of how organizations can foster a more environmentally responsible workforce and develop effective strategies for integrating sustainability into workplace practices.

Building on the broader organizational behavior literature, the distinction between in-role and extra-role behaviors originates from Organizational Citizenship Behavior (OCB) research (Podsakoff et al., 2000). Translating OCB into the environmental domain, scholars emphasize that IRGB reflects compliance-oriented, task-related behaviors that are formally prescribed, while ERGB reflects proactive and discretionary initiatives that go beyond formal duties (Norton et al., 2014). Importantly, recent studies have demonstrated that these two forms of green behavior are shaped by different antecedents. For instance, organizational policies and structured HR practices are often stronger predictors of in-role actions, whereas individual factors such as environmental knowledge and attitudes exert a greater influence on extra-role engagement (Chaudhary, 2020). Distinguishing between IRGB and ERGB therefore not only provides conceptual clarity but also allows for more nuanced managerial implications. This dual perspective is particularly relevant in the healthcare sector, where both compliance with environmental protocols and voluntary initiatives are essential to achieving meaningful ecological outcomes.

2.2. The Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) (Ajzen, 1991) is a widely applied psychological framework for predicting and explaining human behavior across various domains, with particular relevance to environmentally responsible practices in organizational contexts. Within this framework, an individual's behavior is shaped by three key determinants: attitude, social norms, and perceived capacity to act. These factors together shape intentions, and ultimately guide actions. In the context of employee green behavior (EGB), TPB provides a systematic lens for analyzing how employees engage in environmentally responsible workplace actions. Specifically, it suggests that employees' workplace sustainability practices are shaped by their knowledge, attitudes, and perceived ability to perform these behaviors (Blok et al., 2015; Yuriev et al., 2020).

2.3. Social Exchange Theory (SET)

While the Theory of Planned Behavior (TPB) explains individual motivation, it does not fully capture the broader social and organizational influences on Employee Green Behavior (EGB). To address this, Social Exchange Theory (SET) (Homans, 1958), derived from economic exchange theory, offers an additional framework that highlights how reciprocal relationships shape human actions through a rational evaluation of costs and benefits within social interactions (Blau, 1964). From the perspective of SET, behavioral choices stem from a cost-benefit assessment, where they evaluate whether their actions will be met with favorable responses from their social or organizational environment. When employees perceive that their contributions are acknowledged and valued, they tend to adopt behaviors consistent with social or institutional expectations (Raziq, 2025). The theory has been extensively employed in organizational research to account for how individuals form commitments, develop trust, and participate in cooperative behaviors in response to perceived support and incentives.

3. HYPOTHESES DEVELOPMENT AND PROPOSED MODEL

3.1. The impact of environmental knowledge on Green Behavior and attitude

Knowledge in this domain can be defined as the extent to which an individual is aware of and understands issues such as climate change, ecological degradation, and the consequences of human activities, shaped by personal experiences, skills, and competencies (Pagiaslis & Krontalis, 2014; Safari et al., 2018). It acts as a critical cognitive resource that allows individuals to assess the environmental consequences of their actions, thereby fostering pro-environmental behavior both within and beyond formal job roles (Harun et al., 2011; Su & Scott, 2019). Although knowledge may not always directly predict behavior, it helps overcome psychological barriers such as misinformation and fear, while motivating environmentally responsible actions through greater awareness (Leeming et al., 2013; Levine & Strube, 2012). Furthermore, from the perspective of Social Exchange Theory, environmental knowledge also contributes to the formation of positive environmental attitudes by helping individuals recognize the personal and societal benefits of sustainable practices (Van Birgelen et al., 2011). As such, knowledge not only influences behavior but also shapes the attitudinal foundation necessary for long-term engagement in environmental actions. Hence, the hypotheses are formulated as follows:

H1a: Environmental knowledge positively influences in-role green behavior (IRGB).
H1b: Environmental knowledge positively influences extra-role green behavior (ERGB).
H1c: Environmental knowledge positively influences environmental attitude (EA).

3.2. Environmental attitude and its influence on green behavior

Attitude has long been regarded as a central factor shaping human actions. Fishbein & Ajzen (1975) describe it as an individual's overall positive or negative assessment of performing a particular act. Within the ecological domain, environmental attitude (EA) reflects the degree of one's concern for ecological issues and the extent to which a person supports practices that safeguard natural resources and promote sustainability (Milfont et al., 2010; Chan et al., 2014). Fryxell & Lo (2003) also define attitude as an evaluative response, either favorable or unfavorable towards an object, action, issue, or person. Those with a high level of ecological concern are generally more inclined to engage in sustainable behaviors, such as energy saving and recycling (Bayaah et al., 2010; Abdollahzadehgan et al., 2013). Conversely, negative environmental attitudes tend to reduce the likelihood of engaging in such behaviors.

This relationship between attitude and behavior is reinforced by the Theory of Planned Behavior (Ajzen, 1991), which identifies attitude toward a behavior as one of the three central factors shaping behavioral intention, ultimately leading to actual performance. In the workplace context, TPB has been widely used to explain pro-environmental actions by employees, indicating that those with stronger ecological attitudes are more inclined to display green practices (Davison et al., 2014; Blok et al., 2015; Yuriev et al., 2020). Thus, employees who perceive environmental protection positively are more inclined demonstrate responsible ecological actions, both within and outside their assigned duties.

Within organizations, a strong environmental attitude increases the likelihood that employees will engage in both obligatory eco-friendly practices (in-role green behavior) and voluntary contributions (extra-role green behavior), such as volunteering for green initiatives or promoting sustainability among colleagues (Norton, 2014). From this reasoning, the following hypotheses are proposed:

H2a: Environmental attitude has a positive impact on in-role green behavior (IRGB).
H2b: Environmental attitude has a positive impact on extra-role green behavior (ERGB).

3.3. Green human resource management and its impact on green behavior

Green Human Resource Management (GHRM) can be understood as a system of HR policies and practices designed to foster sustainability within organizations. It generally encompasses green recruitment, environmental training, performance appraisal based on green criteria, and reward systems that recognize eco-friendly behaviors (Chen & Chang, 2014; Kim et al., 2017). Grounded in Social Exchange Theory (Blau, 1964), the relationship between GHRM and employee behavior can be explained through reciprocal norms. When organizations demonstrate their dedication to ecological goals, employees are more likely to respond with pro-environmental behaviors. These responses can manifest both in-role within the boundaries of formal job responsibilities and extra-role (beyond assigned duties), such as voluntarily promoting sustainability among colleagues or initiating green projects (Ahmadi et al., 2010). Accordingly, this study proposes the following hypotheses:

H3a: Green human resource management has a positive impact on in-role green behavior.
H3b: Green human resource management has a positive impact on extra-role green behavior.

Based on foundational theories and empirical studies both domestically and internationally, the author proposes the following research model (Figure 1)

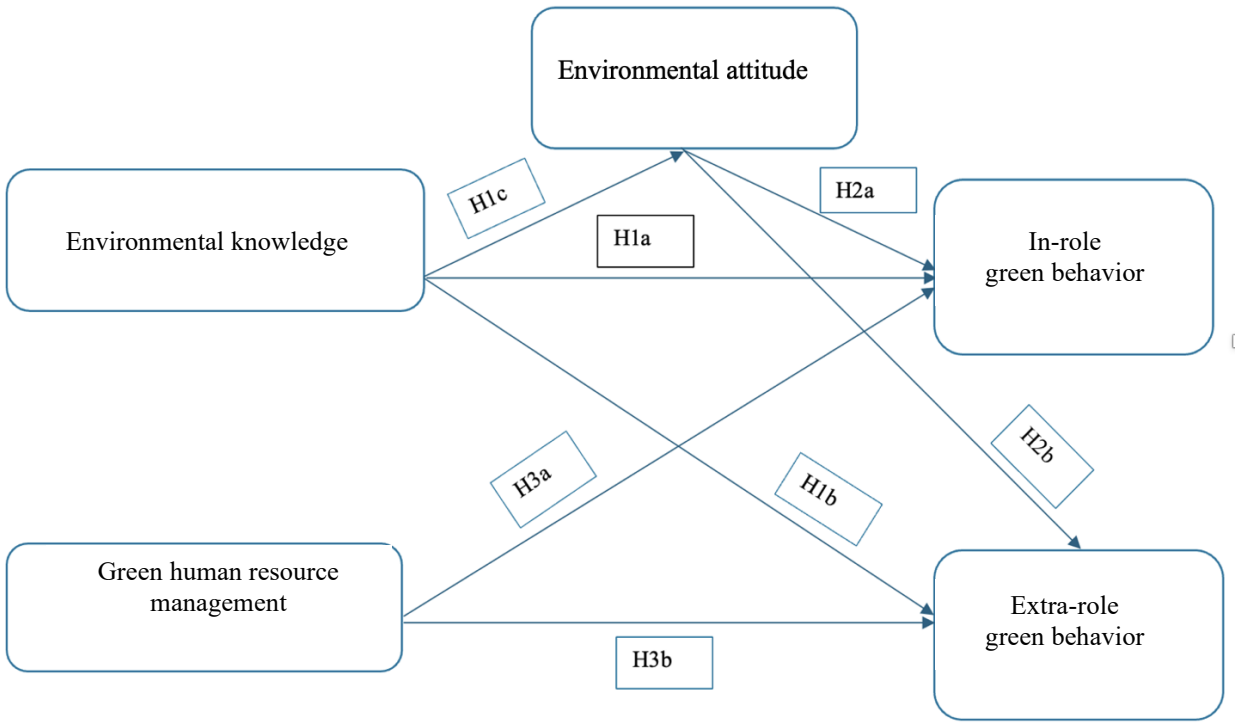


Fig. 1. Proposed research model

4. METHODOLOGY

4.1. Sample and data collection

To examine the predictive relationships between environmental knowledge, environmental attitude, and green human resource management on employees' green behavior in the healthcare sector, a quantitative correlational design was implemented. Participant perceptions were gathered through a structured questionnaire using a five-point Likert response format.

The study applied convenience sampling. Based on Bollen's (1989) guideline, the recommended sample size for structural equation modeling ranges from 5 to 10 participants per observed variable. With 17 observed indicators, an acceptable sample size ranges between 85 and 170. Additionally, Comrey and Lee (1992) categorize a sample of 200 as adequate for factor analytic procedures. This study successfully obtained 203 valid responses, meeting the adequacy threshold for multivariate statistical techniques. Data collection was conducted between April and May 2025

across healthcare facilities located in Hanoi, Vietnam. Both online and offline methods were used. The online survey was administered through Google forms and distributed via social networking platforms such as Facebook and Zalo. To avoid duplication, Google Forms restricted submissions to one per email account. In parallel, printed surveys were handed directly to healthcare employees at their workplaces for offline data collection.

The inclusion criteria focused on healthcare professionals such as doctors, nurses, and clinical staff who were currently working at hospitals and clinics in Hanoi. All responses were coded and analyzed using Microsoft Excel 2024 and SmartPLS version 4.0.9.8. Table 1 provides the descriptive statistics summarizing the demographic profile of the respondents.

Table 1. Sample Demographics

		Frequency	Percent (%)
Gender	Male	93	45.8
	Female	110	54.2
Sector	State	91	44.8
	Private	112	55.2
Position	Doctor	43	21.2
	Nurse	41	20.2
	Midwife	39	19.2
	Orderly	34	16.7
	Other healthcare staff	46	22.7
Experience	< 1 year	9	4.4
	≥ 1-3 years	26	12.8
	> 3 - 5years	66	32.5
	>5 - 10 years	55	27.1
	> 10 years	47	23.2

4.2. Measurement

A structured questionnaire functioned as the central method of data collection. All constructs in the model were drawn from established literature.

Specifically, the Green human resource management (GHRM) variable was assessed using 5 items adapted from Chaudhary (2020) and Sabokro et al. (2021). The purpose of these items was to measure the extent of HR initiatives implemented by healthcare organizations to advance ecological responsibility. An example item states, "My healthcare organization sets environmental goals for employees to implement in their work".

Environmental Knowledge (EK) was evaluated using 3 items adapted from Safari et al. (2018) to assess the respondents' awareness and understanding of environmental issues relevant to healthcare settings, including pollution sources and environmental protection practices. One EK example item is, "I have a good knowledge about the environmental issues".

Environmental Attitude (EA) was measured by 5 items, derived from Safari et al. (2018), to assess individuals' affective and evaluative orientations toward environmental issue. The items captured the extent to which participants value, support, and are emotionally concerned about environmental sustainability. One example item of EA states, "I have a positive impression of healthcare organizations that are committed to being environmentally responsible".

In-role Green Behavior (IRGB) was measured by 3 items based on Bissing-Olson et al. (2013) and Sabokro et al. (2021), which describe the integration of eco-friendly actions within formal job responsibilities. A representative item is: "I carry out the responsibilities outlined in my job description in a manner that supports environmental sustainability."

Extra-role Green Behavior (ERGB) was assessed through 3 items adapted from Safari et al. (2018) and Sabokro et al. (2021), reflecting voluntary green initiatives undertaken beyond assigned duties. A sample item reads: "I voluntarily participate in or promote initiatives that reduce environmental footprints in the healthcare facility".

In total, 17 survey items were included. Responses were recorded using a five-point Likert scale (1 = strongly disagree; 5 = strongly agree). The survey underwent translation into Vietnamese followed by back-translation to English to safeguard semantic accuracy. Expert review and pilot testing confirmed the clarity and consistency of the items.

4.3. Data analysis

To analyze the hypothesized relationships, the study utilized Partial Least Squares Structural Equation Modeling (PLS-SEM). This technique is suitable for datasets of varying sizes and is robust against violations of normality (Hair et al., 2019). The analytical process followed a two-step approach: first validating the measurement model, then examining the structural model (Henseler et al., 2009).

In the measurement model, indicator reliability was assessed through standardized outer loadings, with values above 0.70 deemed acceptable, and those below recommended for removal (Chin, 1998; Hair et al., 2019). The reliability of the constructs was confirmed through Cronbach's Alpha and Composite Reliability (CR), both surpassing the acceptable cut-off value of 0.70. Convergent validity was ensured by confirming item loadings above 0.50 (Ringle et al., 2020). Discriminant validity was tested using the Fornell–Larcker criterion, stipulating that the square root of the AVE for each factor must be greater than the inter-construct correlations (Fornell & Larcker, 1981).

The structural model was evaluated through a bootstrapping procedure with 5,000 resamples to test the significance of path coefficients (Henseler et al., 2009). Multicollinearity (VIF), the coefficient of determination (R^2), and hypothesis testing were also conducted to assess model adequacy (Hair Jr et al., 2021).

5. RESULTS

5.1. Measurement model

Initially, the outer loadings of the observed indicators were examined. Indicators with loadings below 0.70 were considered for exclusion, as they may not adequately reflect their corresponding latent constructs. After the removal of such items, the retained indicators all demonstrated loadings exceeding the 0.70 threshold, thereby supporting their relevance within the measurement model (see Table 2).

Table 2. Outer loadings

	EA	EK	ERGB	GHRM	IRGB
EA1	**0.886**				
EA2	**0.927**				
EA3	**0.917**				
EK1		**0.866**			
EK2		**0.860**			
EK3		**0.891**			
ERGB1			**0.918**		
ERGB2			**0.948**		
ERGB3			**0.937**		
GHRM1				**0.883**	
GHRM2				**0.886**	
GHRM3				**0.893**	
GHRM4				**0.886**	
GHRM5				**0.904**	
IRGB1					**0.896**
IRGB2					**0.917**
IRGB3					**0.905**

The constructs' reliability and validity were assessed through Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE). As indicated in Table 3, the results demonstrate that all measurement constructs achieved Cronbach's alpha and CR values above the 0.70 benchmark, confirming strong internal consistency. Moreover, the AVE values for every construct surpassed the 0.50 criterion, thereby ensuring sufficient convergent validity.

Table 3. Construct reliability, convergent validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
EA	**0.896**	**0.898**	**0.935**	**0.828**
EK	**0.843**	**0.845**	**0.905**	**0.761**
ERGB	**0.927**	**0.928**	**0.954**	**0.873**

GHRM	**0.935**	**0.937**	**0.950**	**0.793**
IRGB	**0.891**	**0.891**	**0.932**	**0.821**

The Fornell–Larcker criterion was employed to assess discriminant validity. As indicated in Table 4, the square roots of the AVE values for each construct exceeded the corresponding inter-construct correlations, thereby confirming discriminant validity. Furthermore, evidence from Table 5 reinforces this validity, as all HTMT ratios were below 0.90.

Table 4. Fornell- Lacker criterion

	EA	**EK**	**ERGB**	**GHRM**	**IRGB**
EA	0.910				
EK	0.429	0.872			
ERGB	0.792	0.594	0.934		
GHRM	0.389	0.299	0.556	0.890	
IRGB	0.728	0.477	0.815	0.656	0.906

Table 5. HTMT

	EA	**EK**	**ERGB**	**GHRM**	**IRGB**
EA					
EK	**0.493**				
ERGB	0.869	**0.671**			
GHRM	**0.423**	**0.332**	**0.594**		
IRGB	**0.814**	**0.550**	0.896	**0.717**	

5.2. Structural model and hypothesis testing

Path analysis was performed using structural equation modeling with the PLS-SEM technique to evaluate the proposed hypotheses. To ensure robustness of the findings, a bootstrapping approach with 5,000 subsamples was applied. The outcomes of this estimation are reported in Table 6.

Table 6. Path Coefficients and T-Statistics for Hypothesis Evaluation

Hypothesis	**Path**	**Original Sample (O)**	**Sample Mean (M)**	**Standard Deviation (STDEV)**	**T Statistics (|O/STDEV|)**	**p-values**	**Hypothesis Result**
H1a	EK -> IRGB	0.134	0.135	0.045	3.014	**0.003**	Supported
H1b	EK -> ERGB	0.271	0.271	0.040	6.819	**0.000**	Supported
H1c	EK -> EA	0.429	0.430	0.056	7.619	**0.000**	Supported
H2a	EA -> IRGB	0.507	0.506	0.045	11.252	**0.000**	Supported
H2b	EA -> ERGB	0.579	0.577	0.043	13.420	**0.000**	Supported
H3a	GHRM -> IRGB	0.418	0.420	0.047	8.967	**0.000**	Supported
H3b	GHRM -> ERGB	0.250	0.251	0.042	6.001	**0.000**	Supported

Figure 2 illustrates the structural model along with the path coefficients and corresponding p-values for each construct.

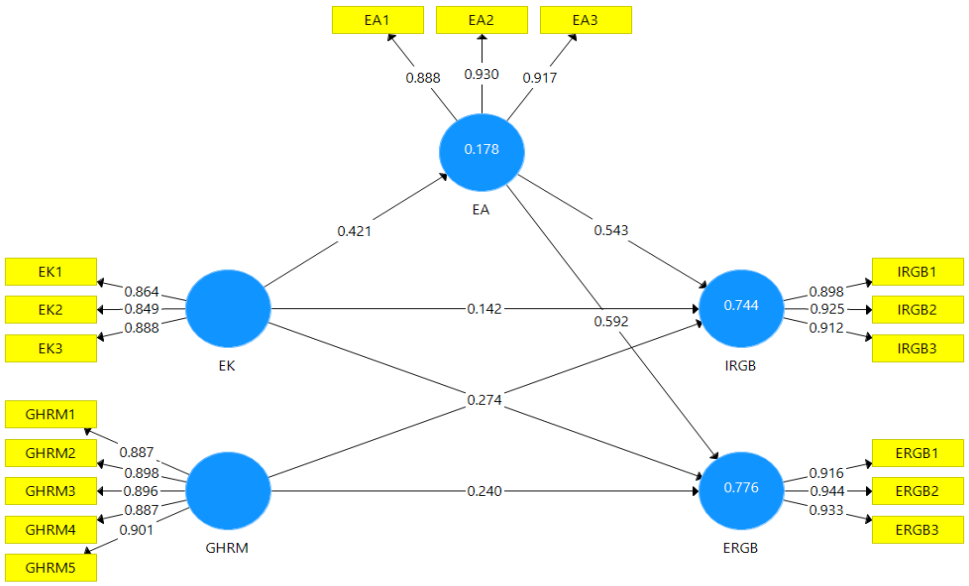


Fig. 2. Structural Model with Path Coefficients and p- values

Both indirect effects were statistically significant ($p < 0.05$). Among them, the path from Environmental knowledge (EK) to Extra-role green behavior (ERGB) via Environmental attitude (EA) was stronger ($\gamma = 0.249$) than the corresponding path to In-role green behavior (IRGB) ($\gamma = 0.218$).

Table 7. Mediating role environmental attitude

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
EK -> EA -> IRGB	0.218	0.217	0.035	6.305	**0.000**
EK -> EA -> ERGB	0.249	0.248	0.035	7.112	**0.000**

The findings in Table 8 show that all inner VIF values are below the recommended threshold of 5, indicating that multicollinearity is not a concern in the model. Moreover, full collinearity VIFs below 3.3 also serve as an effective test of common method bias (CMB) (Kock, 2015). As all VIF values were well below this threshold, the results further confirm that CMB is not a serious issue in this study. Regarding explanatory power, the adjusted R^2 values suggest that Environmental Knowledge (EK) accounts for 18.0% of the variance in Environmental Attitude (EA). Additionally, the model explains 75.4% of the variance in Extra-role Green Behavior (ERGB) and 70.3% of the variance in In-role Green Behavior (IRGB), demonstrating strong predictive power.

In terms of effect size (f^2), following Cohen's (1988) guidelines, the effect of EK on EA is medium ($f^2 = 0.226$). For Extra-role Green Behavior (ERGB), Environmental Attitude (EA) shows a large effect ($f^2 = 1.026$), while EK ($f^2 = 0.241$) and GHRM ($f^2 = 0.214$) have medium effects. Regarding In-role Green Behavior (IRGB), both EA ($f^2 = 0.653$) and GHRM ($f^2 = 0.496$) exhibit large effects, whereas EK has a small effect ($f^2 = 0.049$).

Table 8. R-Square, Cohen's f Square and VIF values

Variable	R^2	f^2	VIF
EA	0.180	->ERGB:1.026 ->IRGB: 0.653	->ERGB: 1.349 ->IRGB: 1.349
EK	0.754	->EA: 0.226; ->ERGB:0.241 ->IRGB:0.049	-> EA: 1.000 ->ERGB: 1.258 ->IRGB: 1.258
GHRM	0.703	->ERGB:0.214 ->IRGB: 0.496	->ERGB: 1.208 ->IRGB: 1.208
IRGB	-	-	-
ERGB	-	-	-

6. DISCUSSION

This study's findings highlight critical mechanisms through which Environmental Knowledge (EK), Environmental Attitude (EA), and Green Human Resource Management (GHRM) affect employees' environmentally responsible behavior in healthcare sector. All proposed hypotheses were statistically supported, reinforcing the robustness of the research model.

Firstly, EK significantly impacts both In-role Green Behavior (IRGB) and Extra-role Green Behavior (ERGB), with a stronger effect observed on ERGB (H1a, H1b). This suggests that employees who possess greater environmental awareness are more likely to engage in voluntary eco-friendly actions that extend beyond their assigned roles. EK also demonstrated a strong positive relationship with EA (H1c), supporting earlier researches that emphasize the importance of environmental knowledge in cultivating positive environmental attitudes (Van Birgelen, 2011).

Secondly, EA emerged as the strongest predictor of both IRGB and ERGB (H2a, H2b), with particularly high path coefficients ($\beta = 0.507$ and $\beta = 0.579$). These results are consistent with the Theory of Planned Behavior (TPB), which posits attitude as a central determinant of behavior (Ajzen, 1991). The strong influence of EA highlights the critical role of affective and evaluative perceptions in motivating sustainable behaviors, particularly in the healthcare context where ethical standards and professional responsibility are emphasized.

Thirdly, GHRM practices also had significant positive effects on both types of green behavior (H3a, H3b). This supports the logic of SET, which proposes that environmentally supportive HR policies encourage employees to reciprocate with pro-environmental actions (Ahmadi et al., 2010). The greater impact of GHRM on IRGB than on ERGB underscores the essential role of organizational support in driving sustainable work practices.

Moreover, EA was found to act as a mediator between EK and green behavior. This means that environmental knowledge not only directly influences green behavior but also indirectly through the formation of positive attitudes towards the environment. The indirect effect on ERGB ($\gamma = 0.249$) through EA was stronger than on IRGB ($\gamma = 0.218$). This suggests that education and awareness- raising efforts will be more effective in promoting voluntary, proactive behaviors when they are "filtered" through employees' positive attitudes. This finding underline the critical role of attitudes in closing the cognitive - behavioral gap, particularly in contexts where personal initiative and commitment are essential.

These findings are broadly consistent with previous studies on employee green behavior. Ababneh (2021) and Shahzad et al. (2023) also confirmed the strong role of Green HRM practices in fostering employees' environmentally responsible behaviors, particularly in reinforcing compliance-oriented actions that align with in-role tasks. Similarly, Norton et al. (2014) emphasized that positive organizational climates significantly encourage employees to engage in discretionary green behaviors, echoing our results that environmental attitudes are the strongest predictors of extra-role actions. In addition, the mediating role of environmental attitude found in this study supports the observations of Safari et al. (2018), who highlighted that knowledge and awareness alone may not be sufficient unless they are transformed into positive attitudes.

On the other hand, some differences also emerge. While Yuriev et al. (2020) reported that perceived behavioral control exerts a substantial influence on pro-environmental actions, our study did not directly address this factor, suggesting an avenue for future research. Furthermore, unlike studies conducted in corporate or educational settings (Chen & Chang, 2014; Bissing-Olson et al., 2013), our findings highlight that in healthcare institutions, organizational support through HRM policies plays an even stronger role in shaping employees' routine green practices. This contextual variation underscores the need to consider sector-specific conditions when examining the determinants of employee green behavior.

7. IMPLICATIONS AND LIMITATIONS

7.1. Theoretical implications

This study contributes to the growing body of literature on pro-environmental behavior in the workplace, particularly in the healthcare context of a developing economy. By integrating both organizational (green human resource management) and individual-level factors (environmental knowledge and environmental attitude), the proposed model offers a broader explanation of what drives employees to engage in sustainable behaviors. The demonstrated mediating role of ecological attitudes reinforces the importance of affective mechanisms in transforming knowledge into action. Furthermore, separating formal job-related and voluntary green behaviors enriches theoretical discussions by showing that different predictors may vary in strength depending on the type of green behavior. The findings support and extend the application of Social Exchange Theory in the environmental management domain.

7.2. Practical implications

For healthcare organizations striving to promote environmental sustainability, the findings suggest several actionable recommendations. First, investing in educational programs that enhance employees' environmental knowledge can lead to more positive attitudes and environmentally responsible behaviors. Second, the promotion of Green HRM initiatives, including the establishment of environmental goals, provision of training, employee recognition, and the offering of green-related benefits, can significantly motivate staff to engage in sustainable

practices. The powerful effect of eco-conscious attitude highlights the importance of communication initiatives and leadership behavior in fostering emotional and moral engagement with environmenttal responsibility. Moreover, managers should consider different approaches depending on whether they aim to influence routine (in-role) or voluntary (extra-role) green actions.

7.3. Study limitations

Several limitations of this research should be acknowledged. First, the data derived from self-reports may carry the risk of socially desirable response bias, especially in measuring green behaviors. Future research could incorporate supervisor or peer ratings to validate employee behaviors. Second, while the sample size was sufficient for SEM analysis, the convenience sampling approach may limit generalizability. Expanding the study to include multiple regions or healthcare systems would enhance external validity. Finally, subsequent work could incorporate further moderators (e.g., organizational culture, green leadership) or mediators (e.g., moral obligation, perceived behavioral control) to further clarify the mechanisms influencing green behavior in the healthcare sector.

8. CONCLUSION

This research contributes valuable contributions to understanding how environmental knowledge, attitudes, and GHRM shape pro-environmental behavior among healthcare employees. By employing a structural equation modeling approach, the research validated a model that distinguishes between in-role and extra-role green behaviors, thus enriching the theoretical landscape of sustainability in organizational settings. The findings highlight environmental attitude as the strongest driver of both formal and voluntary green behavior, aligning with the Theory of Planned Behavior. Environmental knowledge also plays a key role, especially when mediated by attitude. Additionally, GHRM practices significantly influence green actions, emphasizing the value of organizational support. In sum, the results emphasize the need for a dual focus on individual cognition and attitude as well as organizational practices to cultivate a green culture within healthcare institutions. These insights not only contribute to the academic discourse on sustainable behavior in professional contexts but also offer practical guidance for healthcare leaders seeking to align human resource strategies with environmental objectives.

9. REFERENCES

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