



# An empirical investigation on the impact of green human resources management and green leadership on green work engagement

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## ABSTRACT

This research examines the interaction among green human resource management, green leadership, green work engagement, and green organizational culture within an emerging market. Specifically, the research investigates the mediating role of green organizational culture in the relationship between green human resource management, green leadership, and green work engagement in Vietnam's agricultural products industry. Data was collected from 380 employees, revealing that green human resource management and green leadership have a positive effect on green work engagement. Moreover, the findings demonstrate that green organizational culture plays a mediating role in the association between green human resource management, green leadership, and green work engagement. These results contribute to the existing theoretical framework of green human resource management, offering insights into the influence of green human resource management and green leadership on green work engagement through green organizational culture. The research highlights the significance of effective implementation of green human resource management initiatives, green leadership, and the promotion of a green organizational culture to foster employee engagement in environmentally sustainable work practices.

## 1. Introduction

In the context of a severely threatened environment that has directly and indirectly impacted humanity, businesses are increasingly focusing on a greener orientation. The corporate sector is also embracing green human resource management (GHRM), which seeks to sustainably use resources within the enterprise, enhance employee capacity and satisfaction, and drive environmental protection and green economic growth [1]. GHRM refers to the incorporation of environmental considerations into human resources management practices, with the aim of addressing significant environmental challenges on a broader scale [2]. Employees who possess capabilities are valuable assets to a company and need to be developed, maintained, and preserved to ensure that they work comfortably and with high levels of work enthusiasm, thereby increasing the effectiveness of both the employee and the company. Improvements through human resources are indispensable in restoring the operational efficiency of a company. Human resources are complex and unlike other production factors; they require good management, training, and development of their inherent abilities and potential [3]. In particular, conducting GHRM will affect employees' behaviors, attitudes, perceptions, and motivations related to sustainability. GHRM practices impact on employees' green organisational citizenship behaviour was examined by Ref. [4]. Furthermore [5], validated the

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mediating function of GHRM in the relationship between ethical leadership and green work behavior. The role of GHRM practices in mediating the relationship between ethical leadership and both in-role and extra-role green behaviors was highlighted by Ref. [6]. Additionally, the influence of ethical leadership on employees' environmental citizenship behavior was found to be moderated by individual green values, with GHRM playing a mediating role in this relationship [7]. Therefore, organizations can also use human resource management (HRM) to effectively formulate and develop environmentally friendly policies [8].

A gap exists in the HRM behavioral literature, as only a few academic studies have primarily focused on investigating the direct relationships between green HRM practices and environmental performance ([9–11]). While these researches contribute to understanding the organizational conditions and practices involved, there is still a limited number of research that examine the theoretical underpinnings connecting HRM practices to individuals' sustainable behaviors [12]. Prior research is confined to solely exploring the association between GHRM and sustainable outcomes. This narrow focus leaves uncertain as to whether the implementation of GHRM alone can ensure comprehensive safeguarding the natural environment and its resources. Consequently, there is an imperative demand for an innovative research direction, established on strong theoretical bases, that presents an all-encompassing outlook on the manner and rationale behind employees exhibiting varied emotions, attitudes, and conduct when faced with an array of sustainability-related matter [12].

Building upon the aforementioned gaps, the scholar of this research contend that, for employees to wholeheartedly embrace the organization's sustainability goals and effectively address complex environment-related challenges, they must actively engage in green work engagement (GWE), both formally and informally. In the realm of GHRM employees play a significance role in the organization's green management as the implementers of environmental management activities [13]. GWE is the readiness to work on the environmental and green mission with a sense of enthusiasm, pride, and inspiration [14]. Employees with higher GWE contribute to the company through environmentally responsible behavior [15]. Therefore, it is crucial to know how to encourage the GWE of employment. Moreover, examining the connection between GHRM and individual environmental actions through the lens of employee engagement seems logical and improves our understanding of the social and psychological processes that drive employees' GWE.

In addition, the latest development trend in research is looking at the combined roles of leadership and HRM [16]. Leadership and HRM are pivotal aspects in the organizational context [17], as employees perceive their managers as representatives of the organization. Several researches have recommended that GL and GHRM play a significant role in shaping employee eco-friendly conduct [18]. The green leadership (GL) could influence the GWE in this study. GL or leadership that supports environmentally friendly programs is an inspiring and motivating leadership behavior that encourages employees to achieve environmental goals [19]. The confidence in the organization's objectives and practices, including GHRM, arises from the mutual exchange between leaders and their followers. As a result, employees may experience a sense of obligation to reciprocate the economic, emotional, and social support provided by their leaders [20]. This sense of responsibility is manifested in their willingness to demonstrate high levels of enthusiasm, passion, vigor, commitment, and perseverance while carrying out both assigned and discretionary tasks and activities [21].

Specially, it is important for corporate businesses to actively foster a green culture by raising consciousness regarding the significance of mitigating increasing awareness of ecological dangers and enhancing comprehension of environmental matters [22]. Supportive HRM can have a significant impact in fostering a green culture both within the organization and across the industry [23]. A green culture minimizes waste generation in industries, leading to reduced negative environmental impacts [24]. According to Ref. [25], an environmental perspective can be used to foster a green culture within institutions and business organizations. This culture is characterized by a set of values, practices, customs, assumptions, and goals that are centered on the need or desire to become environmentally friendly [26]. further elaborated on this concept, stating that a green organizational culture (GOC) is one where employees are inclined to fulfill their environmental responsibilities and gain a competitive edge over their peers. This competition drives employees to actively engage in the organization's environmental protection efforts, leading to the development of eco-friendly habits and a reduction in environmental waste [27]. As a result, GHRM and GOC play a role in motivating employees to adopt environmentally responsible behaviors [28].

In summary, the importance of implementing GHRM in companies is being recognized and is a primary concern in management literature [29]. Human resource managers seek to train employees on environmental sustainability issues and develop attitudes towards reducing waste in their daily roles [24]. Previous studies have investigated the consequences of GHRM and green behavior in the workplace; notably, GHRM impacts organizational learning capability and environmental performance in rapidly changing contexts [30]. Numerous empirical studies research have examined the factors that influence work engagement and its outcomes [31]. However, there are few studies investigating the affected factors on GWE [32]. Although several studies examine the employee green work engagement, there remains a research gap in understanding the combined effect of GHRM, green leadership, and GOC on GWE.

This study aims to address the research gap. Firstly, the study examines the impact of GHRM on GWE through GOC. Secondly, the study examines the impact of GL on GWE through GOC. It means it examines the interaction among GHRM, GL, GWE, and GOC within an emerging market. Specifically, the research investigates the mediating role of green organizational culture in the relationship between GHRM, GL, and GWE in Vietnam's agricultural products industry. To verify this, data was collected from a sample of employees working in Vietnam's agricultural products industry and tested using SEM. By applying the theory of contagion and social exchange, the research contributes to the theory, specifically as follows: (1) This study add to the existing knowledge on GWE by examining the impact of GHRM and Green Leadership on this construct. (2) Contagion Theory and Social Exchange Theory were employed to develop hypotheses focusing on the interplay between GL and GHRM in shaping employees' engagement in sustainable work practices. (3) The study provides novel empirical evidence on the relationship between Green Leadership, GHRM, and GWE in the agricultural products industry of developing economies, have not been extensively explored in previous research [16]. (4) The implications of the study are significant for business practices, as it highlights significance importance role of GHRM, GL, and GOC, which are not always recognized by businesses as critical factors that influence employees' engagement in environmentally sustainable

work practices.

## 2. Theoretical background and hypotheses development

### 2.1. Theoretical background

The aim of this research is to explore the level of employee engagement in sustainable work practices within the context of Green Organizational Practices, which encompass GHRM, GL, and GOC. The study employs theories such as contagion theory and social exchange theory (SET) to examine the interplay of these green organizational factors in shaping employee GWE. The research endeavors to shed light on the impact of GHRM, GL, and GOC on employee GOC, thus contributing to the existing literature in the field.

Contagion refers to the phenomenon where individuals imitate the actions of others [33], thereby creating a synchronized array of expressions and behaviors. This process occurs through perceptions, consciousness, feelings, and sometimes unconscious actions [34]. The process of emotional contagion begins when a person appears in a group of people and is influenced by the emotions of other members of the group through their language, facial expressions, posture, and interactions [35]. Consequently, it can be seen that when an individual commits to an organization, they can be influenced by the behavior and attitudes of the group, which are shaped by the organizational culture. Thus, contagion occurs when there is linkage between influencers and affected people [36]. This shows that the phenomenon of contagion can occur between employees in the same enterprise, between leaders and employees. Internal culture and especially leadership style are therefore the initials of the contagion behavior and attitudes in the organization.

SET posits that an organization and its employees have mutually beneficial relationships based on trust and commitment, as long as both parties abide by exchange principles that prioritize reciprocity and fair compensation [37]. Consequently, staffs present the GWE as an interaction to the resources they receive from the organization [38]. The reciprocity norm of SET [39] highlights the relationship between GHRM and Green Work Engagement. When organizations establish and effectively implement environmentally sustainable goals, green training and development, green performance management, Green appraisal, and reward systems, which are seen as indicators of the organization's commitment to environmental management practices, employees are more likely to engage in environmentally sustainable work practices, thus increasing their level of GWE. *Green work engagement.*

Work engagement is understood as a happy, joyful, work-related mental state depicted by enthusiasm, devotion and pragmatic task-oriented behaviors [40]. Engagement is defined as the connection level of employees' job in terms of cognition, emotion, and physic. Those who are engaged in their work will do their best to become better performers, take pride in their work, and give considerable attention to their work [41]. Thus, GWE pertains to the positive energy that employees invest in their environmentally sustainable work-related tasks.

The degree to which employees feel connected to their work in terms of cognitive, emotional, and physical aspects can be defined as work engagement. In light of the aforementioned information, GWE can be defined as the energy employees put into their environmentally friendly job tasks, their willingness to make an effort in environmental friendliness, and their absorption in environmentally friendly job tasks [15]. According to Ref. [42], highly engaged employees exhibit these characteristics and are highly involved both cognitively and physically in task performance, and are evaluated highly in work and task performance, as well as creating emotional bonds with their work.

### 2.2. Green organizational culture and green work engagement

In this research, the cultural approach shows the synthesis of values, behaviors, beliefs, and attitudes that are common and relatively stable in the enterprise over time [43]. Corporate culture requires both attention to productivity and production efficiency, and attention to the relationship between leaders and employees, and between people [44]. Corporate culture is considered an effective way of operating to convey to new members the right way to behave to have the same perception, thinking, and feeling about the issues in the company organization [44].

According to Ref. [45], corporate culture relies heavily on cultural traditions [25]. defined a green culture as a set of accepted and expected behaviors of organizational employees in terms of that organizational working style in which focuses on friendly and environmental manners. GOC motivates employees to participate in the organization's environmental vision, promoting active participation in reducing environmental waste and promoting environmentally sustainable practices [28]. This is completely consistent with contagion theory, which is defined as the tendency of some people to follow the behavior of others; thereby creating a synchronized array of expressions and behaviors [33]. Moreover, GOC plays a critical role in effectively implementing green activities [46]. According to Ref. [47], the moral and values upheld by an organization strongly effect on employees' green behavior. Hence, to ensure the success of environmental practices, an organization must cultivate GOC [48]. GOC is therefore an essential prerequisite for continuously enhancing and improving employees' environmental performance [46]. Cultural norms and values shape the behavior of individuals by influencing their actions and decisions. By fostering the sharing of green values and beliefs within the organization, it is possible to drive changes in business methods and management practices that prioritize environmental sustainability [49]. From that, this study give the following hypothesis.

**H1.** Green organizational culture positively influences on green work engagement

### 2.3. Green human resources management, green organizational culture and green work engagement

GHRM is about the HRM practices that focus on company strategy's impact in terms of environment and ecology [2]. [50] identified: that GHRM involves the integration of human resource policies with the goal of preserving natural resources. Therefore, the notion of GHRM, which entails the development and implementation of HRM practices that foster employee engagement, dedication, competence, and motivation in undertaking environmentally-related activities [2], has emerged to support environmental innovations [29]. More specifically, GHRM is described by Ref. [51] as a set of activities that are about green recruitment and hiring green awareness oriented -employment, developing employees' green skills, competencies through green training, and evaluating green performance by setting out green standards, consequently, providing green rewards to praise and encourage successful green goals of that organization.

Previous studies have shown that GHRM, characterized by pro-environmental attitudes within the human resources department, significantly influences the adoption of attitudes and practices in the workplace that prioritize environmental sustainability ([51,52]), thus facilitating the incorporation of a green culture within the organization. Referring to creating a green culture [22], stated that it is important for corporate to eliminate the potential threats to the natural environment and ecosystems and strengthen understanding on environmental issues. At organizational level, the green culture could be promoted by supporting HRM activities. Furthermore [23], demonstrated that GHRM significantly influences the adoption of eco-friendly attitudes and practices, fosters a working environment that encourages the integration of green culture into the organization. Another study figured out that organizational commitment and environment-oriented behaviors of employees were enhanced by GHRM [53].

Numerous HRM studies have consistently demonstrated that strategic and intentional HRM contribute to enhancing employees' commitment and sense of purpose [46]. Organizations that exhibit a commitment to practices of environmental management through explicit green objectives, eco-friendly training and development opportunities, efficient eco-friendly performance evaluations, and incentivization systems, can expect their employees to reciprocate this commitment and environmental efforts by exhibiting green work engagement. According to the SET, employees' involvement in green work can be seen as an interaction with the resources they receive from the organization [38]. The principle of reciprocity within the framework of SET [39] highlights the relationship between GHRM and GWE [38]. proposed that the presence of diverse GHRM in an organization, including green incentives, environmentally conscious hiring processes, and opportunities for green career development [54], can foster a sense of responsibility among employees to respond with increased work engagement. With this discussion, the following hypotheses are put forward.

**H2a.** GHRM has a positive effect on green organizational culture

**H2b.** GHRM has a positive effect on green work engagement

### 2.4. Green leadership, green organizational culture and green work engagement

The concept of green leadership, as per [55], entails the capacity to sway individuals and organizations to attain ecological sustainability objectives over an extended period [56]. define green leadership as that which encourages subordinates to attain environmental goals and inspires stakeholders to surpass anticipated levels of environmental performance. This article adopts a behavioral approach and contends that GL encompasses the conduct of leaders aimed at motivating followers to adopt eco-friendly practices to accomplish sustainable development goals for the company.

Individuals observe their workplace, memorize norms – expected behaviors, and get started to act like others under the same organization, whether consciously or unconsciously [57]. According to contagion theory, the process of emotional contagion is initiated when a person appears in a group of people and is influenced by the emotions of other members of the group through their language, facial expressions, thoughts, etc. potential and interactions [35]. The degree of contagion depends on the level of expression of the influencer, especially when the person being “transferred” likes the influencer. Thus, contagion occurs when there is cohesion between influencers and affected people [36]. Internal culture and especially leader style is therefore the source of behavioral contagion and attitudes in the organization. In other words, the culture of an organization can be modelled to employees through leadership [58]. Consequently, it is imperative to impress upon employees the necessity of embracing a green culture [26].

GL not only entails exhibiting eco-friendly behavior but also assumes the role of a model for followers by instituting regulations, incentives, and penalties [59]. Prior studies have established that managers' GL has a considerable influence on their subordinates [60]. Leaders wield authority, prestige, and serve as role models for employees. Leaders who consistently exhibit eco-friendly behavior are likely to inspire employees to emulate their actions and prioritize environmental resources within the organization [46]. GL primarily focuses on shaping employees' attitudes to foster eco-friendly conduct [61] for safeguarding environmental resources. Based on the preceding discussion, author posit the following hypotheses.

**H3a.** Green leadership has a positive influence on green organizational culture

**H3b.** Green leadership has a positive influence on green work engagement

### 2.5. Mediating role of GOC

Green-shared values and a GOC can bolster organizational capabilities, enabling organizations to convert their strategies into eco-friendly individual and organizational performance [62]. A conducive working environment, characterized by positive relationships between employees and leaders, enhances employee commitment to collectively work towards the company's goals and objectives

[63]. Green leadership not only embodies eco-friendly behavior, but it also inspires similar conduct in followers through the establishment of guidelines, rewards, and penalties [59]. Prior studies have demonstrated that environmentally-conscious leadership from managers positively influences their subordinates [60], particularly impacting pro-environmental behavior [18]. Leadership and HRM are consistently significant situational factors within an organizational context [64], as employees typically perceive their supervisors as representatives of the organization [65]. concurred that the more top-ranking employees value HRM activities, the higher the quality of services they provide to the company. Similarly, hotel staff who are fairly recruited and adequately skilled deliver superior service to customers. In recent years, GWE has garnered attention from organizations. Strategically planned HRM activities, which are tantamount to GHRM in the ecological domain, positively influence the GWE. GHRM practices shape employees' green behavior by fostering an organizational culture that supports greening operations [66].

Based on these lines of reasoning, the following hypotheses are suggested.

**H4a.** Green organizational culture mediates the relationship between GHRM and green work engagement.

**H4b.** Green organizational culture mediates the relationship between green leadership and green work engagement

### 3. Methodology

#### 3.1. Sample and procedure

The questionnaire underwent pre-testing with 7 respondents to ensure content validity. Based on their feedback, the wording of certain items was modified to enhance question clarity. Subsequently, the questionnaires were distributed to collect quantitative data from participants employed in eco-friendly practices in agribusinesses in Vietnam. To overcome the challenges of data collection from agribusinesses that had implemented eco-friendly practices in Vietnam, a convenient sampling approach was adopted. Author selected this industry for examination of conceptual model due to the current heightened pressure from government regulations and increasing environmental concerns among the public. This presents an opportune situation to investigate the proposed model.

The authors also obtained the consents of participants to conduct the study. The author clarified the purpose of the study and ensured confidentiality and anonymity for participants, and their participation was voluntary. The HR manager, who printed and placed it into envelopes, sealed it, and then distributed them to the employees within the company, facilitated the distribution of the questionnaires. In order to mitigate the influence of social desirability bias and maintain anonymity, employees were given the opportunity to complete the survey at their own pace and were given sealed envelopes in which to return it. To address the potential for common method variance bias, author adopted measures recommended by Ref. [67]. This included explicitly defining all relevant concepts in each question and providing examples when necessary, as well as ensuring participant anonymity to minimize the impact of social desirability on responses. A total of 450 questionnaires were distributed to employees, and 380 questionnaires were collected, resulting in a response rate of 84.4 %. The author utilized G\*Power [68] to validate the sample size used in the study. The parameters set were four tested predictors, a power of 0.80, an alpha of 0.05, and an effect size of 0.02. This resulted in a calculated sample size of 311, affirming the sufficiency of the sample size employed in this research. Data was filtered, and entered into the software SPSS and AMOS. Cronbach alpha, EFA, CFA, and SEM were used to assess the reliability of the collected data. The gender distribution of the participants was 40.4 % male and 59.7 % female. Regarding age, 28.4 % of the respondents were below the age of 31, 53.7 % were aged between 31 and 40, and the remaining participants were above the age of 40. Relating to the income aspect, 48.9 % employees have a monthly income of US\$ 435 or less, 37.6 % employees are upper USD 435 and less than US\$ 1304, and 13.5 % ones who are more than US\$ 1304. 97.9 % of the participants are working more than 1 year.

#### 3.2. Measures

The research comprises five concepts encompassing 23 items that were derived from previous studies. The study utilized a 7-point Likert scale to assess participants' responses on all variables, with a score of 1 indicating "strongly disagree" and a score of 7 indicating "strongly agree". GHRM, GWE were adopted from the items from Ref. [15] with six items per each. GL measurements were developed based on [18] with five items. Inherited from Ref. [69], GOC concept was measured by six items.

### 4. Results

#### 4.1. Refinement and Validation measurement

In order to improve the accuracy of the scale, both Cronbach's alpha reliability test and EFA were utilized. The results demonstrated that all measures met the reliability standard. The Cronbach's alpha of all measures fulfilled the requirement, with values ranging from 0.857 to 0.892 (>0.60). The KMO eco efficiencies were 0.913 (0.5<KMO<1), and the sig Bartlett's Test was <0.05. Then, all scales were subjected to an EFA analysis, which showed that the measures met the factor loading requirement (>0.50) and achieved a total variance extracted of 55.057 % (>0.50). The Eigenvalues of all factors were high (>1), with the fourth factor having the lowest Eigenvalues of 1.569 (>1).

The outcomes of the CFA examination reveal that the proposed model has a chi-square value of 389.070 with 224 degrees of freedom ( $p = 0.00$ ), chi-square/df = 1.737. Additionally, the other assessment standards were also fulfilled (TLI = 0.956, CFI = 0.961, GFI = 0.920, RMSEA = 0.044). All observed variables of the scales possess weights greater than 0.5. Thus, it can be inferred that the

model is in agreement with market data. The research concepts satisfy the requisite for composite reliability, with the smallest value being 0.859 and the highest being 0.893. The average variance extracted ranges from 0.509 to 0.589, indicating that the scales exhibit convergent validity (refer to Table 1).

The confirmatory factor analysis results indicate that the proposed model has an acceptable fit to the data. All the items were used to test the structural model and hypotheses.

4.2. Hypothesis testing

The Structural Equation Modeling (SEM) was employed to evaluate the structural model and hypotheses. The model consisted of 225 degrees of freedom. The SEM findings exhibited that the model had a satisfactory fit,  $X^2(225) = 398.111, p = 0.000 < 0.05$ ; Chi-square/df = 1.769 < 3; GFI (goodness of fit index) = 0.920 > 0.9; TLI (Tucker–Lewis index) = 0.954 > 0.9; CFI (comparative fit index) = 0.959 > 0.9 [70]; RMSEA (root mean square error of approximation) = 0.045 < 0.05 [71].” Fig. 1 illustrates the standardized structural paths (see Fig. 1).

Figure 1 presented at 5 % significant level, the GHRM has the positive strongest influence on GOC with a standardized regression coefficient at  $\beta = 0.56$ . In addition, the second is at  $\beta = 0.56$  indicating another significant impact on the GOC on the GWE. There are also at significant level in terms of the influence of GL on GOC, GOC on GWE, and GL on GWE, with specific value of the standardized regression coefficient  $\beta$  at 0.34, 0.26 and 0.15 respectively.

Table 2 indicates the unstandardized structural paths and showed the detailed positive impacts. This result shows that these relationships are statistically significant because they all have  $p < 0.05$ . Therefore, it can be concluded that hypotheses H1, H2a, H2b, H3a, and H3b are supported by the data.

In this study, Covariance-based Structural Equation Modeling (SEM) was utilized to investigate the mediation hypotheses. The results presented in Table 3 indicate that Hypothesis 4a (H4a: GHRM - > GOC - > GWE) is supported ( $\beta = 0.002, p < 0.05$ ), thereby affirming the mediating role of GOC in the relationship between GHRM and GWE. Similarly, Table 3 shows that Hypothesis 4b (H4b: GL - > GOC - > GWE) is also supported ( $\beta = 0.043, p < 0.005$ ), demonstrating that GOC mediates the relationship between GL and GWE. Therefore, the results in Table 3 confirm the indirect effects tested in this study, specifically H4a and H4b, supporting and accepting these hypotheses.

Table 4 reveals that GHRM has a significant and positive direct effect on GOC ( $\beta = 0.56$ ), as well as a positive direct effect on GWE ( $\beta = 0.26$ ). Additionally, GHRM exerts an indirect effect on GWE through GOC, with a beta value of 0.21. GL has a positive direct effect on GWE ( $\beta = 0.34$ ) and a relatively strong indirect effect on GWE through GOC ( $\beta = 0.13$ ). These findings underscore the importance of enhancing GOC in the relationship between both GHRM and GWE, and GL and GWE.

**Table 1**  
Factor loading, reliabilities, and average variance extracted (AVE) results.

Variables Construct	Construct	Factor loading	Cronbach’s alpha	Composite reliability	AVE
<b>Green human resources management</b>	HRM1	0.781	0.892	0.893	0.571
	HRM2	0.804			
	HRM3	0.772			
	HRM4	0.744			
	HRM5	0.724			
	HRM6	0.679			
<b>Green leadership</b>	GL1	0.726	0.875	0.876	0.586
	GL2	0.829			
	GL3	0.751			
	GL4	0.734			
	GL5	0.771			
<b>Green organizational culture</b>	OC1	0.647	0.860	0.861	0.509
	OC2	0.673			
	OC3	0.678			
	OC4	0.716			
	OC5	0.646			
	OC6	0.814			
<b>Green work engagement</b>	WE1	0.706	0.857	0.857	0.586
	WE2	0.719			
	WE3	0.758			
	WE4	0.741			
	WE5	0.671			
	WE6	0.622			

Moreover, the Maximum Shared Variance (MSV) result is smaller compared to Average Variance Extracted (AVE) and Square Root of AVE (SQRTAVE) is higher than Inter-Construct Correlations in the Fornell and Larcker table. Therefore, the research concepts achieve discriminant validity is concluded.

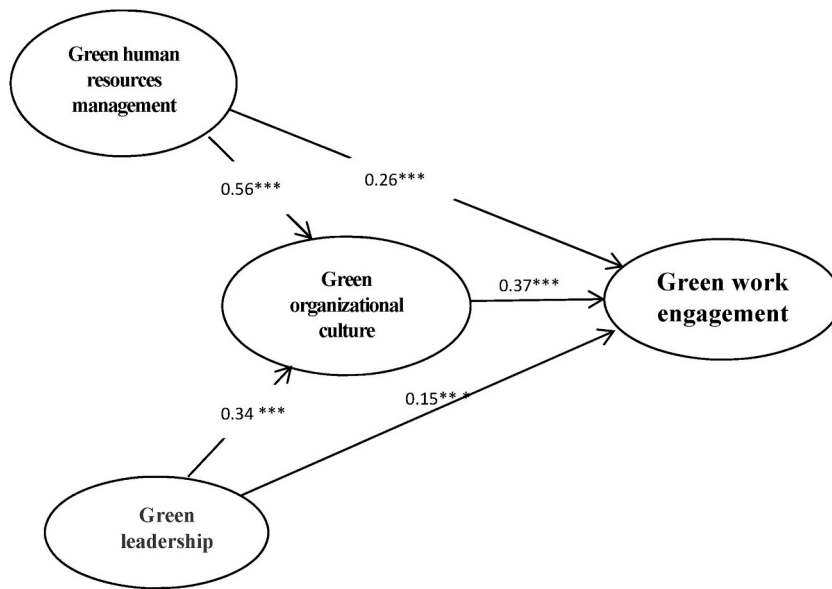


Fig. 1. Results of model testing. \*\*\* Significant at 5 % level.

**Table 2**  
Results of unstandardized estimate model.

Hypotheses	Estimate	S.E.	C.R.	P	Results
H1 Green organizational culture → Green work engagement	0.281	0.060	4.679	***	Supported
H2a Green human resources management → Green organizational culture	0.462	0.050	9.202	***	Supported
H2b Green human resources management → Green work engagement	0.161	0.044	3.686	***	Supported
H3a Green leadership → Green organizational culture	0.284	0.044	6.505	***	Supported
H3b Green leadership → Green work engagement	0.094	0.036	2.596	.009	Supported

Note: \*\*\*Significant at 5 % level.

**Table 3**  
Testing for indirect effect.

Indirect effect	Standardized Indirect Effect	Sig. level	Hypothesis testing
H4a GHRM- > GOC- > GWE	0.001	P < 0.05	Supported
H4b GL - > GOC - > GWE	0.002	P < 0.05	Supported

**Table 4**  
showed the detailed positive impacts of GHRM, GL and GOC on green work engagement are 0.47, 0.28, and 0.37 respectively.

Table 4. Results of standardized direct and indirect effects of among the factors		GHRM	Green leadership	Green organizational culture
Green organizational culture	Direct effect	0.56	0.34	
	Indirect effect			
	Total	0.56	0.34	
Green work engagement	Direct effect	0.26	0.15	0.37
	Indirect effect	0.21	0.13	
	Total	0.47	0.28	0.37

## 5. Discussion and implications

### 5.1. Discussion

This research adds to the body of knowledge in the field GHRM, which aligns with recent research trends [72]. The research model presented in this study explores a new mechanism to clarify the relationship between GHRM and its outcomes. Specifically, this research investigates the impact of GHRM and GL on GWE, mediated by GOC. The agricultural products industry was selected, as the

survey sample, as GL, GHRM, GOC, and GWE are crucial for the sustainability and development of the business. The results suggest that GHRM and GL have a positive influence on GWE. Additionally, there is a significant impact of GOC on GWE, indicating the direct link between GHRM and GWE, and GHRM's impact on GWE operates through a specific mechanism, such as GOC. This demonstrates the mediating role of GOC in the relationship between factors such as GHRM, GL, and the GWE. It means GOC mediates the relationship between GHRM and GWE; as well as GOC mediates the relationship between GL and GWE. This finding aligns with the research conducted by Ref. [73], who also found support for the combined impact of GHRM and green innovation culture on environmental organizational performance. Furthermore, this result is consistent with the study conducted by Ref. [74], which highlighted the significance of a green innovative organizational culture in fostering employees' green behavior and enhancing organizational environmental performance.

This study addresses gaps in the existing knowledge on GHRM by investigating the key factors and processes that influence employee attitudes and behaviors related to sustainability. Specifically, it explores the role of employee engagement, which encompasses cognitive, emotional, and behavioral aspects, in explaining the social and psychological mechanisms behind employees' environmental behaviors. Previous research in this area has primarily focused on testing direct relationships between GHRM and sustainability outcomes, providing limited insights into individual and organizational factors. Therefore, adopting an employee engagement perspective allows for a broader understanding of the green domain. To achieve this, a comprehensive framework comprising green HR practices, GL, and GOC was examined in relation to employees' green work engagement.

The current study corroborated the results of [66] by establishing that GHRM exert a significant influence on employees' pro-environmental behavior by facilitating the formation of an organizational culture. Moreover, regarding the effect of GL on GOC, the results of this research corroborate the crucial role of leaders in shaping organizational identity and culture, which, in turn, have an influence on employees and organizational performance, as highlighted in previous research ([75,76]). This research result is in line with the SET ([37]) in which employees adopt pro environmental behavior and practice GOC.

This study broadens the influence on environmental concerns, GHRM, and GL in forming the GOC. This matched the study of [77], who presented that an organization's concerns on the environment and its other policies and practices should be placed in the working agenda to solve relevant organizational problems. Instead, they need to be institutionalized and incorporated into the values, norms, and practices of the organization, thus developing a strong GOC. Like [44,45], this study contributes to confirm the great effect of leadership on organizational culture. Furthermore, the results support the research conducted by Ref. [75] regarding the impact of GL on GOC. Their study confirms the significant role of leaders in fostering the organizational identity and culture that influence employees and organizational performance [76]. This study not only considers GL but also GOC and the simultaneous impact of these two factors on GWE. Interesting results show that GOC is an important factor leading to employee behavior within the organization, specifically GWE. Another significant contribution of the study is to show the phenomenon of contagion from GL, to GOC and GWE, based on contagion theory.

GL is the ability of a leader to apply good leadership behaviors and to direct and guide subordinates to support the company's environmental programs. The role of GL in affecting employees is significant in achieving the company's objectives. Leaders can serve as exemplary figures for their subordinates to emulate in carrying out environmentally friendly work, which can enhance employee engagement and ultimately increase involvement in green work. It can be concluded that GL has an effect on engagement in green work. The current study's findings lend support to the viewpoint of environmental researchers that green leadership approaches and green attitudes can serve as an effective mechanism to promote green behaviors ([60,78]). This is consistent with studies conducted by Ref. [79], who have claimed that GL significantly affects GWE.

## 5.2. Theoretical implications

This research contributes to the existing research on GL and GHRM as a precursor to GWE. The influence of top-level leaders is often the source of managers and employees' concern about environmental management behavior. Consistent with prior research (e.g., Ref. [80]), the results of this research emphasize the crucial role of leaders in promoting GWE. Therefore, this study highlights the value of training and developing GL. Leaders are recommended to be trained to enhance their ability to develop a green organizational culture, thereby strengthening green work engagement.

This study provides empirical support for the propositions put forth by the contagion theory and social exchange theory, which posit that organizations have an influence on the thoughts and ideas of their employees [81]. The results of this research show a strong correlation between green organizational policies and practices and employees' green work engagement. The establishment of organizational policies and practices that act as incentives for employees to engage in eco-friendly behaviors is the foundation of this relationship. When organizations adopt environmentally friendly policies, implement GHRM practices, and embrace green leadership, they can foster a GOC that encourages pro-environmental behavior at the individual level and facilitates the sustainable production of goods and services over an extended period.

This research makes an important contribution to the uncharted domain of GHRM in a burgeoning market like Vietnam. The research shows empirical evidence that endorses the correlation between GHRM, green leadership, and GWE. The outcomes of this research are anticipated to augment the existing literature on the establishment of GHRM, green leadership, and GWE in transitioning economies. Moreover, the findings may stimulate additional investigations on GHRM, green leadership, and GOC, in alignment with sustainable development objectives.

This study presents insights that would be valuable for both theoretical and management perspective. The study could be initial research on investigating the overall impact of environmental concerns, GHRM, and GL on green organization culture and its impact on employee work engagement and environmental performance. In summary, this research has contributed to our understanding of the

overall influence of GHRM, green leadership, and green organizational culture, which are relatively new aspects in the area of organizational environmental performance [82].

### 5.3. Managerial implications

This study offers valuable insights for managers and policymakers seeking to promote GWE and enhance environmental performance to achieve cleaner and more sustainable production. To achieve this, organizations need to align all their strategies, policies, and practices to develop a comprehensive supportive system. Merely having environmental awareness is not enough; HRM practices and leadership behaviors and styles should be designed with a shared green focus. Several factors contribute to the development of a GOC. For instance, raising employees' environmental awareness can strengthen their attitudes towards the environment and resource usage. Additionally, leadership behaviors play a crucial role in guiding and coordinating efforts towards establishing a vision, mission, values, and objectives that prioritize developing a cleaner production system, commonly known as a "green organization." Therefore, to ensure green benefits and an excellent environment, management must imbue environmentally-friendly leadership thinking in their managers. This can be achieved through effective strategic training programs and policy planning. In addition, management needs to prioritize recruitment process policies for leaders, with a particular emphasis on environmental issues. To enhance the effectiveness of GL, it is necessary to incorporate appropriate reward systems. These visionary elements should then be integrated into HRM practices, such as recruiting environmentally conscious individuals, providing environmental training, recognizing and rewarding employees' green initiatives, and empowering them with the necessary infrastructure and resources. By following these approaches, organizations can foster the development of a GOC that effectively enhances employees' GWE.

This study advocates that companies should strengthen their GHRM practices by: establishing environmentally conscious objectives for their workforce; delivering green training programs to instill eco-friendly values; imparting green skills and knowledge for sustainable management practices; incorporating green workplace behavior of employees into performance evaluations; aligning green workplace conduct with incentives and remuneration; and factoring in green conduct of employees into promotion decisions. Simultaneously, the leader strengthens GL such as offering promotions and incentives to employees for green performance, specifically recognizing green business innovation, rewarding the development of environmentally friendly ideas, showing enthusiasm towards protecting nature, and providing training and coaching on environmental issues.

It is crucial for managers and human resource professionals to implement both formal and informal means of communication that effectively convey the company's commitment to and strategic emphasis on environmental sustainability in their operations and procedures. This will enhance employee engagement in environmentally conscious work practices. Transparent communication channels will stimulate employee interest in the company's ecological goals and encourage their participation in the creation of innovative green initiatives. For example, creating platforms such as green group discussions, environmental suggestion boxes, and online group functionality can facilitate real-time collaboration among employees, allowing them to share thoughts, ideas, videos, and documents. This collaborative environment encourages knowledge exchange among peers, promotes eco-initiatives, and facilitates the adoption of innovative approaches when addressing various environmental issues.

The study results call for the employees' intervention to practice as environmental activists. From the lens of organization, to better manage the environment and promote employee GWE in the workplace is to implement effectively and successfully GHRM activities.

It is recommended that HRM practitioners within the enterprise prioritize the recruitment and training of leaders who possess key green qualities. This approach will further facilitate positive leader-member interactions and encourage employees to engage in knowledge sharing, cooperation, and role exchange while working on environment-related tasks. It is essential for those in leadership positions, such as managers, supervisors, and team leaders, to have the ability to motivate and inspire their subordinates. This can be achieved by developing and implementing performance and compensation management systems that incorporate environmental objectives and eco-performance standards. Leaders should also provide constructive feedback and offer both intrinsic and extrinsic recognition for environmentally conscious behaviors. The creation of selection tools to assess green behaviors and the design of training programs to address various green qualities will enhance leaders' abilities to foster employee engagement in environmentally sustainable work practices.

## 6. Limitations and directions for future research

There are study limitations that map out the future research opportunities. Firstly, the collected data for the proposed model is just one single source (employees) at a time. Secondly, the study examined an intermediate variable (green organizational culture) among the investigated links. Future studies could consider other intervention variables such as green participation environment, green awareness organization support, and organizational identity.

In addition, further research should examine the different modes of the impact of GOC aspects on GWE. That will bring contributions that are more specific to managers in building organizational culture criteria suitable for each working environment. Finally, to understand more broadly the phenomenon of spreading of GHRM, GL to GOC, GWE of employees, and finally customer attitudes towards the organization and services, further research should be considered to expand customer surveys about their satisfaction and attitude with service staff, service, and business.

## 7. Conclusions

The current study thoroughly examines the impact of GHRM and green leadership on GWE, while considering the mediating role of

GOC based on contagion theory and social exchange theory. Data was collected from agricultural production enterprises in Vietnam. The results show that GHRM has a positive impact on GWE. Additionally, there is a significant impact of GOC on GWE, indicating a direct relationship between GHRM and GWE and the impact of GHRM on GWE operates through a mediating mechanism of GOC. Furthermore, this study not only considers GL but also GOC and the simultaneous impact of these two factors on GWE. Interesting results show that GOC is an important factor leading to employee behavior in organizations, specifically GWE. Another important contribution of the study is to demonstrate the contagion phenomenon from GL to GOC and GWE. The results call for further investigation to deepen existing knowledge about GHRM and green leadership, with specific emphasis on elucidating the underlying mechanisms regulating the relationship between GHRM practices and their outcomes.

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### Additional information

No additional information is available for this paper.

### Data availability statement

Data will be made available on request.

### Ethical statements

There was no ethics or institutional committee in place at a researcher's institution at the time the study was conducted. This study examines social human behavior unrelated to drugs or vaccines, based on the fully informed and voluntary consent of the participants. Participants are informed about the study and remain completely anonymous.

### CRedit authorship contribution statement

**Nguyen Khanh Hai Tran:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e21018>.

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