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KEYWORDS	ABSTRACT
Green Human Resource Management, Environmental Performance, Green Organizational Culture, Employee Environmental Commitment, Green Transformational Leadership, Banking Sector, PLS-SEM, Pakistan.	Green Human Resource Management (GHRM) is often viewed as a driver of organizational sustainability; yet, little research is available to explain the mechanisms by which GHRM enhances environmental performance in emerging economies. To bridge this gap, the present study explores the direct impact of Green Human Resource Management on Environmental Performance and the mediating roles of Employee Environmental Commitment (EEC) and Green Organizational Culture (GOC) along with the moderating role of Green Transformational Leadership (GTL). Data were collected utilizing a quantitative research approach with a cross-sectional survey design. Primary data was acquired through a standardized questionnaire which was administered to the employees working in the banking sector of Pakistan. After data screening, a total of 102 replies were obtained and 100 valid questionnaires were maintained for statistical analysis. The measurement and structural models were assessed and the presented hypotheses were tested by the Partial Least Squares Structural Equation Modelling (PLS-SEM) in SmartPLS. The research indicates that Green Human Resource Management has no statistically significant direct effect on Environmental Performance. Employee Environmental Commitment does not significantly moderate the association between Green Human Resource Management and Environmental Performance as well. In contrast, Green Organizational Culture played a substantial mediating role in this connection suggesting that organizational culture was the main mechanism through which green HR practices contributed to environmental sustainability. This study is different from prior studies that studied these mechanisms separately by examining two mediators and one moderator simultaneously in one model. The present study offers a thorough explanation of the organizational processes underpinning environmental sustainability through the integration of the Resource-Based View, Ability-Motivation-Opportunity Theory, and Social Exchange Theory.
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Introduction

The topic of environmental sustainability has turned into a growing concern for worldwide organizations. Issues such as climate change, pollution, depletion of natural resources, and loss of biodiversity have led governments, corporations, and communities to reassess the manner in which economic activities are conducted in recent years. Organizations today are expected to do more than merely make a profit. They are designed to reduce their influence on the environment and help create a more sustainable future. Environmental regulations and technological advances are critical to sustainability, but the ultimate test of these projects is in the hands of the people implementing them. The day-to-day activities, choices, and habits of workers can have a significant impact on the environmental performance of a business. In this regard, apart from environmental regulations and operational measures, the strategic management of human resources to develop a sustainable workplace culture is progressively gaining momentum.

Background of the Study

Environmental sustainability has emerged as a key organizational concern of the twenty-first century. Growing awareness of climate change, resource scarcity, and environmental degradation has forced corporations to go beyond regulatory compliance and to include ecological concerns into their strategic and operational decision-making. One of these transitions is the emergence of Green Human Resource Management (GHRM) as the channel for organizations to translate environmental intent into employee behavior. This is achieved by integrating recruitment, training, performance appraisal, and reward systems with environmental goals, thus making sustainability something employees enact rather than something firms merely profess (Awan et al., 2023; Qalati et al., 2024).

Problem Statement

Organizations still fail to turn green intentions into quantitative environmental performance, despite sustainability moving further up the world’s agenda. GHRM provides a systematic approach to incorporate environmental values into organizational systems through green recruitment, training, evaluation, and reward practices (Awan et al., 2023; Qalati et al., 2024).

Research Gap

The review of the existing literature highlights many gaps that need to be addressed. While previous research has consistently found a positive relationship between Green Human Resource Management (GHRM) and environmental performance, most existing studies have focused on direct effects and provided little insight into the internal organizational processes through which

GHRM initiatives lead to actual environmental outcomes. Thus, the drivers of the effect of green HR practices on better environmental performance have not been well delineated.

Research Questions

In order to address these gaps, this study will address the following research questions:

1. What is the effect of Green Human Resource Management (GHRM) on Environmental Performance (EP)?
2. Does Green Organizational Culture (GOC) mediate the relationship between GHRM and Environmental Performance (EP)?
3. Does Employee Environmental Commitment (EEC) mediate the interaction of GHRM and EP?
4. How does Green Transformational Leadership (GTL) moderate the relationship between GHRM and Environmental Performance?
5. What is the moderating influence of Green Transformational Leadership (GTL) on GHRM and Green Organizational Culture (GOC)?
6. What is the moderating role of Green Transformational Leadership (GTL) on the link between GHRM and Employee Environmental Commitment (EEC)?

Research Objectives

- To examine the effect of Green Human Resource Management (GHRM) on Environmental Performance (EP).
- To examine the mediating influence of Green Organizational Culture (GOC) between GHRM and Environmental Performance.
- To investigate the mediating role of Employee Environmental Commitment (EEC) between GHRM and Environmental Performance.
- To examine the moderating effect of Green Transformational Leadership (GTL) on the relationship between GHRM and Environmental Performance.
- To examine the moderating influence of Green Transformational Leadership (GTL) on the relationship between GHRM and Green Organizational Culture (GOC).

- To examine the moderating role of Green Transformational Leadership (GTL) in the relationship between GHRM and Employee Environmental Commitment (EEC).

Literature Review

As organizations realize the importance of human capital in attaining environmental sustainability, the scholarly community is paying greater attention to Green Human Resource Management (GHRM). Fundamentally, GHRM is the integration of environmental management principles into HR policy and practice to develop sustainable employee behavior and enhance organizational environmental performance (Masri & Jaaron, 2017). The present research found that GHRM had an indirect effect on environmental outcomes through the mediating role of organizational and psychological variables—i.e., green organizational culture and employee environmental commitment—which affected environmental performance (Roscoe et al., 2019; Pham et al., 2019) in addition to direct effects. Thus, GHRM is better conceptualized as a multidimensional construct working through multiple interconnected pathways, rather than as a single straightforward mechanism.

Green Human Resource Management

The concept of “green human resource management” was first proposed by Renwick et al. (2008) to refer to HRM-related dimensions of environmental management. The construct has evolved into a separate research stream on how HRM implementation practices facilitate organizational environmental management (Jackson & Seo, 2010; Jabbour et al., 2015). This is not a peripheral research interest. GHRM has gained substantial traction in the broader environmental management literature (Ren et al., 2018) and subsequent work treats it as a key mechanism, not one option among many, for accomplishing organizational environmental goals (Jabbour & de Sousa Jabbour, 2016; Chaudhary, 2019).

Environmental Performance

The extent to which an organization controls its environmental impact is referred to as its environmental performance (EP), which is operationalized through outcomes such as the reduction of hazardous effluent, emissions, greenhouse gases, and solid waste (Van Hoek, 1999). One of the earliest and most influential research streams regards EP as a driver of financial performance, showing that environmentally proactive firms can cut costs by reducing waste and energy consumption, attract environmentally conscious customers, and enjoy better returns on equity and assets (Zhu & Sarkis, 2004; Al-Tuwaijri et al., 2004; King & Lenox, 2002; Klassen & McLaughlin, 1996; Molina-Azorin et al., 2009; Miles & Covin, 2000; Lee et al., 2016). But it's not a uniform relationship. Lucas and Noordewier (2016) find that the effect of EP on financial performance is actually larger for “dirty,” non-proactive industries than for industries that are already relatively clean and proactive, implying diminishing financial returns to environmental investment after a

baseline level of proactivity is established, and warning against the idea of a simple, generalizable rule linking EP and financial performance.

Green Culture in Organizations

Green Organizational Culture (GOC) is the values, symbols, assumptions, and artefacts of an organization that signify its commitment to being ecologically responsible (Harris & Crane, 2002). This term is situated within the wider tradition of organizational culture research, where culture is defined as the shared mental assumptions that govern action and interpretation, specifying proper behavior for a given setting (Ravasi & Schultz, 2006). When extended to the environmental domain, this is the pattern of shared basic assumptions about environmental issues and environmental management (Marshall et al., 2015; Chen, 2011; Schein, 2010). Thus, a GOC is not simply a stated environmental policy but a deeper, often tacit set of norms about what “appropriate” environmental behavior looks like within a given organization. More specifically, these are shared beliefs, values, norms, symbols, and social expectations that influence the normal behaviors expected of organizational members (Chang, 2015). This environmental symbolism is not abstract but actively shapes how members perceive and act on sustainability issues day to day (Umrani et al., 2016).

Green Transformational Leadership

Transformational leadership drives followers to go beyond expectations through different behavioral characteristics, most notably intellectual stimulation, which raises followers' confidence and increases internal motivation and external performance (Bass et al., 2003; Dvir et al., 2002). In the environmental domain, Green Transformational Leadership (GTL) motivates subordinates to pursue environmental goals in addition to business performance (Chen & Chang, 2013; Bass, 1998) by creating a supportive, stimulating environment and providing the contextual resources needed to act on creative environmental ideas (Jung et al., 2003). This ‘alongside, not instead of’ framing is important: it shows that the function of GTL is to eliminate the seeming trade-off between environmental and economic objectives, which is exactly the kind of leadership condition under which GHRM practices would be anticipated to transfer into outcomes most successfully.

Conceptual Model Development and Hypotheses

The proposed model suggests that GHRM has a significant role in encouraging environmentally responsible behaviors in organizations. The adoption of green HR practices facilitates the development of a supportive green organizational culture and enhances employees' environmental commitment, which together lead to greater environmental performance. In this context, GOC and EEC are mediating mechanisms that describe the process via which GHRM leads to better environmental outcomes. Moreover, Green Transformational Leadership is conceptualized as a moderating variable that strengthens the efficiency of GHRM by affecting employee attitude,

organizational culture, and total environmental performance. This integrated model offers a comprehensive view of the direct, indirect, and conditional interactions between the variables.

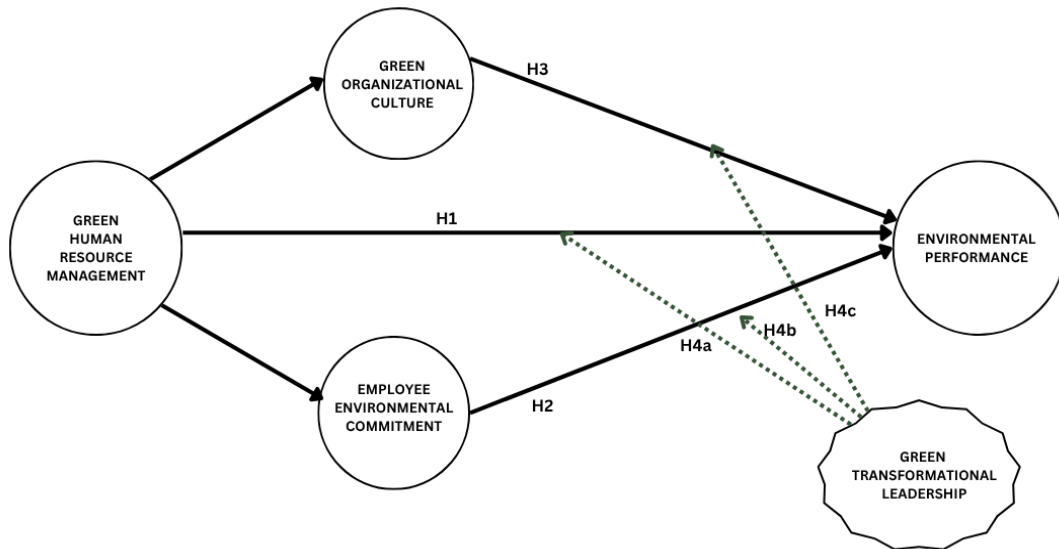


Figure 1: Conceptual Model Framework

GHRM and Environmental Performance Role

Environmental performance GHRM methods and green human aid management improve personnel's environmental awareness and encourage environmentally friendly behavior in the workplace (Saeed et al., 2019). The business weather and increasing competitiveness have forced businesses to apply new techniques inside the HRM issue (Alzubi & Akkerman, 2022). Researchers (Anwar et al., 2020) have well-defined GHRM as operating "thru HRM hiring, schooling, profitable, reimbursement and appraisal which cover environmental consciousness and the creation of a green group of workers leading to the expertise of environment-friendly values and practices." Based on the RBV idea, GHRM practices as an organizational support emphasize the motivation of employees and the creation of an eco-friendly work atmosphere. Thus, employees showcase their skills and EP is improved (Pham et al., 2020), with green recruiting focusing on the selection of individuals displaying seasoned-environmental behavior (Guerci et al., 2016; Pham et al., 2020).

H1: Green HRM has a positive influence on Environmental overall performance.

Employee Environmental Commitment as a Mediator

In Social Exchange Theory (Emerson, 1976), personnel who feel organizational aid are expected to reciprocate with correct attitudes and behaviors (Jiang et al., 2012). The reciprocal trade mechanism shows that it is necessary to monitor the impact of organizational practices on the long-

term behavioral repercussions of employees (Paillé & Mejía-Morelos, 2014). Worker attitudes are an important end result of HRM activities, and good HRM procedures are recognized to elicit good worker attitudes including commitment (Nishii et al., 2008; Katou et al., 2014). Although empirical evidence on the relationship between GHRM and employee environmental commitment is still limited, past research indicates that environmentally orientated HR practices are important in shaping employees' green attitudes. For example, Perez et al. (2009) showed that the presence of environmental management frameworks helps ameliorate the inexperience of employees' views and their commitment to environmental goals.

H2: Employee Environmental Commitment mediates the interaction between Green Human Resource Management and Environmental Performance.

Mediating Effect of Green Organizational Culture

GHRM is a very centered and efficient strategy in terms of enhancing the ability and motivation of employees and giving them ample opportunities to connect with environmental conduct (Saeed et al., 2019). The application of GHRM operations increases employee awareness toward the environment. This focus influences the beliefs and values of employees to establish a green culture in the firm (Roscoe et al., 2019). A green way of life can change the behavior of employees and stresses the use of green techniques within the agency. The green subculture enhancement makes the workforce think in an eco-friendly method. It is a vital driver for the implementation of green practices (GHRM) since green culture is believed to be established when all the people of the organization participate in the greening projects of the organization (Rizvi & Garg, 2021). Burki et al. (2018) concluded that GOC is a strategic lens to achieving economic success apart from EP objectives. GOC can have a major role in strengthening overall organizational performance and competitiveness (Nazarian et al., 2017). Muisyo et al. (2022) examined the role of enablers of green subculture in the relationship between GHRM and firm competitive advantage, while Muisyo & Qin (2021) investigated the moderating role of green innovation culture between GHR practices and a firm's green performance.

H3: Green organizational culture mediates the link between Green HRM and overall Environmental performance.

Green Transformational Leadership as a Moderator

This view adds to a better understanding of the importance of GTL as a leadership behavior that stresses the desire to spur the growth of employees' abilities and supporting clear organizational visions, in line with the enterprise's environmental needs. GTL encourages personnel to study new things, actively take part in novice techniques, and interact in environmentally accountable behaviors, hence improving their Environmental performance (EP). GTL is an important equipment for corporations (Visitor & Teplitzky, 2010) and plays a critical duty within the advent of an environmentally friendly organizational setting. Recent studies have supported the amazing link of GTL with pro-environmental benefits (Zhou et al., 2018). According to Stinglhamer et al. (2015),

GTL helps give guidance to subordinates, creating a helpful environmental attitude and gathering their requirements. According to Singh et al. (2020), GTLs are often prone to believe in their followers' green competencies and value their contribution to environmental duties. Furthermore, GTL is vital for understanding the development of improving assisting GHRM practices and guidelines (Jia et al., 2018), and it impacts the psychological environment of personnel (Nohe & Hertel, 2017; Kranabetter & Niessen, 2017).

H4a: Green Transformational management moderates the effect of GHRM on EP.

H4b: Transformational management moderates the relation between GHRM and green EEC.

H4c: Transformational green management moderates the relationship between GHRM and GOC.

Research Methodology

This chapter presents the research methodology to study the relationships between Green Human Resource Management (GHRM) and Environmental Performance (EP), the mediating roles of Employee Environmental Commitment (EEC) and Green Organizational Culture (GOC), and the moderating role of Green Transformational Leadership (GTL). It describes the research design, sample characteristics, data collection procedures, measuring device, and data analysis procedures used in this study.

Research Design

The research was carried out within a positivist perspective. Positivism is concerned with a phenomenon which can be quantified statistically, and allows for statistical generalization (Cohen et al, 2011). Survey research was used as the study strategy in this evaluation and this is congruent with the positivist paradigm. The data for the analysis was collected using quantitative research methods.

Research Method

The current study employs a quantitative research strategy as it intends to statistically test hypothetical relationships between variables. Data were gathered from respondents at one-time point using a cross-sectional study approach. The study is explanatory as it seeks to explain the influence of GHRM on environmental performance through mediating and moderating factors. The design is suitable for testing theoretical models and for exploring causal relationships among components.

Questionnaire Design

In the present study, a questionnaire survey was used which is a standard method used in empirical investigations to collect replies. The questionnaire was developed based on the features of green

human resource management, green organizational culture, employee environmental commitment, green transformational leadership, and environmental performance. Items used to operationalize constructs are derived from a review of the literature and have been utilized in previous studies. The questionnaire was developed in the English language only. This study is a self-report study. Participants are asked to describe their past or present work experiences and organizational behaviors.

Table 1: Sources of Questionnaire Items

Constructs	Code	No. of Items	Scholars Citation
Green Human Resource Management	GHRM	6	(Aggarwal & Agarwala, 2023; Younis & Hussain, 2023)
Green Organizational Culture	GOC	6	(Aggarwal & Agarwala, 2023)
Employee Environmental Commitment	EEC	4	(Pham et al., 2019)
Green Transformational Leadership	GTL	5	(Younis & Hussain, 2023)
Environmental Performance	EP	6	(Aggarwal & Agarwala, 2023; Younis & Hussain, 2023)

Variables

In this study, all variables were measured using modified existing and previously validated literature.

- Green Human Resource Management (GHRM) was measured by aspects associated with green recruitment, training, performance management and rewards.
- Employee Environmental Commitment (EEC) was measured with measures of employees' psychological attachment to environmental goals.
- The Green Organizational Culture (GOC) was studied by measuring factors related to shared environmental values and norms inside the company.
- Green Transformational Leadership (GTL) was measured by leadership behaviors that foster environmental sustainability.
- Environmental Performance (EP), which was measured by indicators addressing the environmental results of the organization.

Measurement of Variables

In the present study, a five-point Likert-type scale was used. A Linkert scale is an assessment of the attitudes, views and perceptions of an individual or group on social issues. Items were rated on a five-point **Likert scale (1= strongly disagree to 5= strongly agree)**.

Sampling

The target demographic of this study consists of workers working in Banking industry or organizations which have implemented or are currently working on implementing environment friendly practices. The total number of replies gathered was 102 and data filtering resulted in a final sample of 100 valid responses. Two responses deleted due to inadequate information. Probability sampling approaches i.e. simple random sampling technique was used in this study to select the respondents. Sample size was calculated based on recommendations for structural equation modelling (SEM) to ensure sufficient statistical power for analysis (Hair et al, 2010).

Data Collection

Primary data were obtained through the use of a **structured questionnaire**. The data were collected through online professional networking platforms, such as LinkedIn where friends and acquaintances received an email with a link to a web-based questionnaire that they are invited to complete and forward on to other people they know. Participants were informed about the goal of the study and were assured of confidentiality and anonymity to provide honest responses. Participation was on a voluntary basis.

Data Analysis and Result

Here the data analysis is presented and the outcomes are discussed. First is the Demographic Profile. Subsequently, the model assessment is provided (measurement model assessment and structural model assessment).

Demographic Profile

The demographic features were measured by Gender, Age, Organization, and Job Experience.

Table 2: Demographic Profile

Category	Group	Percentage
Gender	Male	55.8%
	Female	44.2%
	Prefer not to say	0.00%
Age	20 – 25 years	40.4%
	26 – 30 years	44.2%
	31 – 35 years	18.1%
	36 and above	11%
Organization	Banking Sector	91.6%
	Non-banking Sector	8.4%

Job Experience	0 – 5 years	73.1%
	6 – 10 years	22.2%
	11 – 15 years	3.3%
	16 and above	1.4%

Descriptive Analysis

The variables are analyzed in descriptive study with standard deviation, mean, and median values.

Table 3 Descriptive Analysis

Variable	Mean	Median	Standard Deviation
EEC	0.000	0.875	1.000
EP	0.000	0.004	1.000
GHRM	0.000	-0.031	1.000
GOC	0.000	0.029	1.000
GTL	0.000	0.006	1.000

The table 3 shows the descriptive statistics of the study variables namely, Green Human Resource Management (GHRM), Employee Environmental Commitment (EEC), Green Organizational Culture (GOC), Green Transformational Leadership (GTL) and Environmental Performance (EP). All constructs have mean values close to 0 and a standard deviation of 1.000 for each variable. This signifies that the data were standardized prior to analysis, so they are on comparable scales, having a mean of 0 and a standard deviation of 1. The median values are slightly different for each of the constructs, EEC having the highest median value (0.875) followed by GOC (0.029), GTL (0.006) and EP (0.004) whilst GHRM has a slightly negative median value (-0.031). The median values are near to zero, which indicates that the variables are rather symmetrically distributed and do not exhibit a large skewness. The descriptive statistics indicate that the data are appropriately distributed and suitable for subsequent PLS-SEM analysis.

Result

PLS is a robust method for testing a structural model and can be used to propose probable relationships and to validate hypotheses (Hair et al., 2012). PLS has fewer demanding assumptions about sample size, residual distribution and measurement scale compared to covariance-based SEM (Chin, 2010). Furthermore, PLS has attracted much attention in research because to its increasing application (Ringle et al., 2012).

Measurement Model Analysis

It is important to confirm the measurements accurately reflect the constructs. The first step in presenting the results of the PLS analysis is to evaluate the validity and reliability of the measurement items, also referred to as indicators or items. In addition to the accuracy, this section

provides an evaluation of the discriminant and convergent validity of the measures. The measurement model estimated by PLS-SEM is presented in Figure 3.1. The model consists of five latent categories namely Green Human Resource Management (GHRM), Green Organizational Culture (GOC), Employee Environmental Commitment (EEC), Green Transformational Leadership (GTL), and Environmental Performance (EP).

All indicator loadings are above the recommended threshold of 0.70, indicating strong indicator reliability and confirming that the observed variables adequately represent their respective latent constructs. Specifically, indicators associated with EP, GTL, and EEC show particularly high loadings, indicating that Environmental Performance outcomes, leadership behaviors, and environmental commitment are consistently perceived by respondents. Although some GHRM and GOC indicators show relatively lower loadings, they remain within acceptable limits, reflecting the multidimensional nature of organizational and HR-related green practices. The measuring model also shows acceptable levels of explanatory power for the endogenous dimensions. Green Organizational Culture (GOC) explains a considerable percentage of variance ($R^2 = 0.405$), which indicates that GHRM practices are instrumental in influencing organizational culture. The Employee Environmental Commitment (EEC) has a lower but acceptable level of explained variation ($R^2 = 0.114$). This means that although GHRM contributes to employee commitment, other contextual or individual level factors may be at play. Environmental Performance (EP) has good explanatory power ($R^2 = 0.673$) indicating the cumulative effect of GHRM, GOC, EEC and leadership dynamics on employee outcomes.

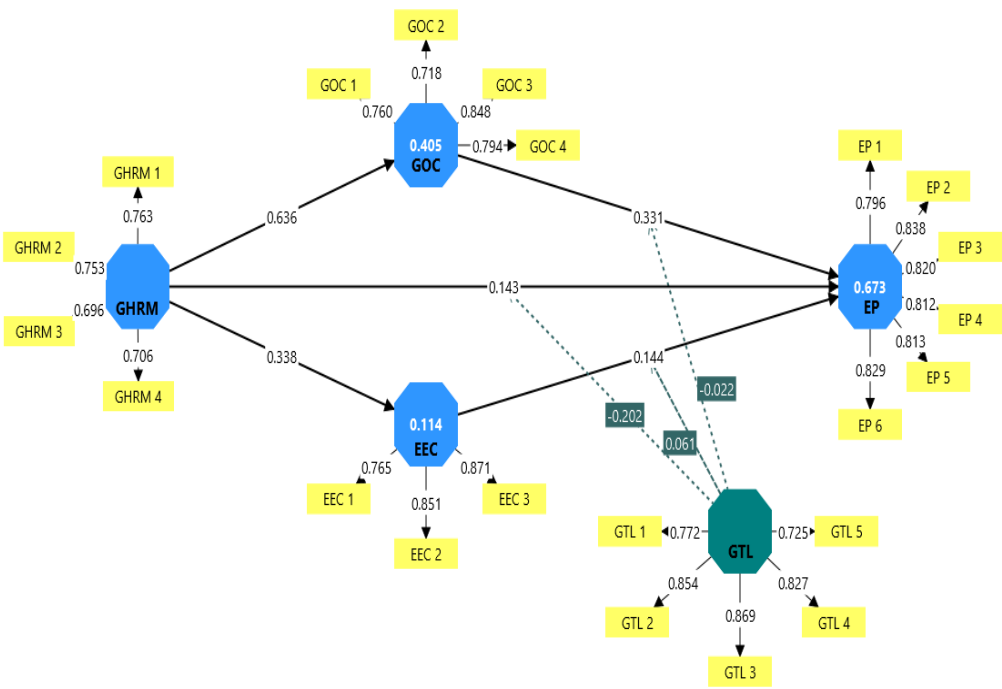


Figure 2.Measurement Model Analysis Placeholder

Construct Reliability and Validity

In additional research articles, the validity and reliability of the latent variables should be validated, so as to complete the structural model analysis. Validity is measured by convergent and discriminant validity.

Table 4: Outer Loadings

Indicator	GHRM	EEC	GOC	GTL	EP
GHRM1	0.763				
GHRM2	0.753				
GHRM3	0.701				
GHRM4	0.706				
EEC1		0.765			
EEC2		0.851			
EEC3		0.871			
GOC1			0.718		
GOC2			0.848		
GOC3			0.794		
GOC4			0.760		
GTL1				0.772	
GTL2				0.854	
GTL3				0.869	
GTL4				0.827	
GTL5				0.725	
EP1					0.796
EP2					0.838
EP3					0.820
EP4					0.812
EP5					0.813
EP6					0.829

Indicator Reliability (Outer Loadings)

Table 5.3 presents the internal consistency reliability and convergent validity of all the constructs, which are satisfactory. Cronbach's alpha values range from 0.713 to 0.901, which is above the minimum acceptable threshold of 0.70, indicating a reasonable level of internal consistency of the assessment items. Additionally, the composite reliability values of all constructs are over 0.70, which further confirms the trustworthiness of the measurement model. Convergent validity is tested using Average Variance Extracted (AVE). All constructs have AVE values above the recommended cutoff value of 0.50 (see Table 5.4), which shows that each construct explains more

than half of the variance in its indicators. Notably, the convergent validity of EEC (AVE = 0.689) and EP (AVE = 0.669) is especially good, which indicates the high quality of measurement. AVE of GHRM is lower (0.533) but still above the acceptable threshold and hence can be included in the model.

Table 5 Cronbach α , rho-A, Composite reliability (CR) and Average variance extracted (AVE) of the constructs

Construct	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
EEC	0.775	0.794	0.869	0.689
EP	0.901	0.905	0.924	0.669
GHRM	0.713	0.717	0.820	0.533
GOC	0.788	0.798	0.862	0.611

- All Cronbach's alpha >0.7 indicates indicators reliability (Numally et al, 1967).
- All rho_a >0.7 indicates indicators reliability (Dijkstra & Henseler, 2015).
- All rho_c >0.7 implies internal consistency (Gefen et al, 2000).
- All average variance extracted AVE >0.5 indicates convergent validity (Bagozzi & Yi, 1988; Fornell & Larcker, 1981).

Internal Consistency Reliability

Reliability for internal consistency was examined using **Cronbach's Alpha**, **Composite Reliability (rho_a)** and **Composite Reliability (rho_c)**. Values higher than 0.70 imply that the measurement items have good reliability and internal consistency (Hair et al., 2022). As indicated in Table 5, all constructs were above the acceptable level of 0.70. Cronbach's Alpha scores ranged from **0.713 to 0.901** and Composite Reliability (rho_a) values ranged from **0.717 to 0.905**. The Composite Reliability (rho_c) scores were between **0.820 and 0.924**, showing a good level of internal consistency reliability for all constructs. The results demonstrate that the measurement items are consistently measuring their respective latent construct and the instrument is reliable for further analysis.

Convergent Validity

The **Average Variance Extracted (AVE)** was used to assess the convergent validity. AVE quantifies the amount to which the construct explains the variation of its indicators. The convergent validity is considered sufficient when the AVE value is **0.50 or above** according to the standard criteria. As can be seen in Table 5.4, the AVE values of all constructs are above the acceptable value of 0.50, ranging from **0.533 to 0.689**. For example, the AVE of EEC, EP, GHRM and GOC were **0.689**,

0.669, 0.533 and 0.611 respectively. The results indicate that each construct explains more than 50% of the variation of its indicators, indicating satisfactory convergent validity. Hence, the indicators sufficiently represent their underlying constructs and support the validity of the measurement model.

Discriminant Validity

Discriminant validity was examined by three complimentary criteria: **Fornell-Larcker criterion**, **cross-loadings** and **Heterotrait-Monotrait Ratio (HTMT)**. These strategies were applied to ensure that each construct measures a unique notion and is empirically different from other constructs in the model. Diagonals are square root of AVE of latent variable.

Table 6: Fornell-Larcker Criterion (Diagonals are square root of AVE)

	EEC	EP	GHRM	GOC	GTL
EEC	0.830				
EP	0.504	0.818			
GHRM	0.338	0.556	0.730		
GOC	0.460	0.718	0.636	0.782	
GTL	0.523	0.734	0.543	0.694	0.811

Table 7: Cross Loadings

Indicator	EEC	EP	GHRM	GOC	GTL	GTL x EEC	GTL x GOC	GTL x GHRM
EEC1	0.765	0.379	0.260	0.367	0.404	-0.252	-0.051	-0.065
EEC2	0.851	0.374	0.242	0.338	0.459	-0.417	-0.096	-0.044
EEC3	0.871	0.485	0.328	0.429	0.443	-0.379	-0.047	-0.120
EP1	0.404	0.796	0.421	0.558	0.598	-0.012	-0.007	-0.107
EP2	0.461	0.838	0.509	0.626	0.717	-0.027	-0.116	-0.198
EP3	0.349	0.820	0.428	0.608	0.678	0.048	-0.041	-0.240
EP4	0.450	0.812	0.474	0.547	0.505	-0.039	-0.174	-0.305
EP5	0.305	0.813	0.424	0.565	0.486	-0.114	-0.160	-0.194
EP6	0.490	0.829	0.465	0.611	0.580	-0.202	-0.222	-0.175
GHRM1	0.127	0.365	0.763	0.510	0.340	-0.070	0.002	0.206
GHRM2	0.243	0.415	0.753	0.385	0.340	-0.056	0.025	0.256
GHRM3	0.356	0.246	0.696	0.340	0.394	-0.249	-0.166	0.151
GHRM4	0.271	0.529	0.706	0.566	0.482	0.086	-0.003	-0.194
GOC1	0.507	0.789	0.444	0.760	0.574	0.007	-0.074	-0.269
GOC2	0.372	0.437	0.419	0.718	0.418	-0.203	-0.146	-0.121

GOC3		0.226	0.488	0.592	0.848	0.584	-0.065	0.044	0.156
GOC4		0.307	0.463	0.532	0.794	0.568	0.070	0.087	0.164
GTL1		0.469	0.679	0.427	0.538	0.772	-0.158	-0.152	-0.208
GTL2		0.446	0.561	0.410	0.537	0.854	-0.063	-0.082	-0.078
GTL3		0.502	0.567	0.462	0.656	0.869	-0.142	-0.216	-0.131
GTL4		0.434	0.648	0.479	0.576	0.827	-0.033	-0.105	-0.151
GTL5		0.232	0.480	0.419	0.502	0.725	0.009	0.022	-0.028
GTL	x	-0.422	-0.068	-0.073	-0.051	-0.101	1.000	0.387	0.074
EEC									
GTL	x	-0.096	-0.247	0.110	-0.034	-0.156	0.074	0.462	1.000
GHRM									
GTL	x	-0.076	-0.145	-0.039	-0.026	-0.138	0.387	1.000	0.462
GOC									

Table 8: HTMT Matrix

	EEC	EP	GHRM	GOC	GTL	GTL EEC	x	GTL GOC	x	GTL GHRM	x
EEC											
EP	0.591										
GHRM	0.452	0.660									
GOC	0.573	0.823	0.820								
GTL	0.628	0.808	0.675	0.828							
GTL x EEC	0.478	0.095	0.186	0.124	0.107						
GTL x GOC	0.089	0.154	0.080	0.126	0.153	0.387					
GTL x	0.104	0.262	0.326	0.256	0.158	0.074		0.462			
GHRM											

Model Fitness

Checking the model fit is very important to see how well the model fits the underlying structure of the data. To evaluate model fit, the indices and metrics employed are the Standardized Root Mean Square Residual (SRMR), ULS (Unweighted Least Square Discrepancy), G (Geodesic Discrepancy) and Chi-Square. The model fit statistics of the proposed PLS-SEM model, saturated and estimated model configurations are shown in Table: 5.8 The SRMR value of the calculated model is **0.147**, which is barely above the conventional criterion of **0.10** (Henseler et al., 2015), implying that the model does not offer the best global fit. Similarly, the NFI score of **0.563** is below the normal cut-off value of **0.90** indicating a poor level of normed fit. The Chi-square value of **740.537** is high, but is consistent with the well-documented sensitivity of this measure to large sample sizes and model complexity (Hair et al., 2019).

Table 9: Model Fitness

Metric	Saturated Model	Estimated Model
SRMR	0.105	0.147
d_ULS	2.793	5.436
d_G	1.430	1.620
Chi-square	703.537	740.537
NFI	0.585	0.563

Structural Model Assessment

Following an evaluation of the validity and reliability of the measures, the focus next moves towards the structural model. PLS analysis is very sensitive to the importance of each route estimate and the amount of variance explained.

Collinearity Assessment

After the measurement model, one should carefully examine the structural model before making any conclusions. Hair et al. (2012) states that the variance inflation factor (VIF) value of five or more indicates a collinearity problem in the structural model. As can be seen in Table 5.9, the values of VIF are between **1.156 and 3.470**, which are far lower than the crucial value of **5.0**. Therefore, there is no problem of multi-collinearity in the measurement model and each indicator gives unique information. The absence of multi-collinearity further increases the interpretability and robustness of the model, ensuring that the interactions examined are real theoretical associations and not statistical aberrations. The result demonstrates that the indicators and constructs are unique in information and the parameter estimates in the structural model later are unlikely to be biased or exaggerated due to redundancy among the variables.

Table 10: Variance Inflation Factor (VIF) Values

	VIF
EEC1	1.394
EEC2	1.901
EEC3	1.778
EP1	2.365
EP2	2.672
EP3	2.274
EP4	2.407
EP5	2.924
EP6	2.779
GHRM1	1.616
GHRM2	1.604
GHRM3	1.352
GHRM4	1.156

GOC1	1.401
GOC2	1.514
GOC3	2.818
GOC4	2.484
GTL1	1.695
GTL2	3.185
GTL3	3.470
GTL4	2.248
GTL5	2.049

Hypothesis Testing – Bootstrapping

The bootstrap method was used to estimate the significance of the route coefficients, or model hypotheses H1-H4. Bootstrapping (Adams et al., 2007) gives an estimate of the form, dispersion and bias of the sampling distribution of a specific statistic. SmartPLS can generate T-statistics for significance testing of the inner and outer model via a method called bootstrapping. A large number of subsamples are drawn from the original sample, for example 5000, and are replaced in this procedure to give bootstrap standard errors. These standard errors then yield estimated T-values for testing if the structural path is significant.

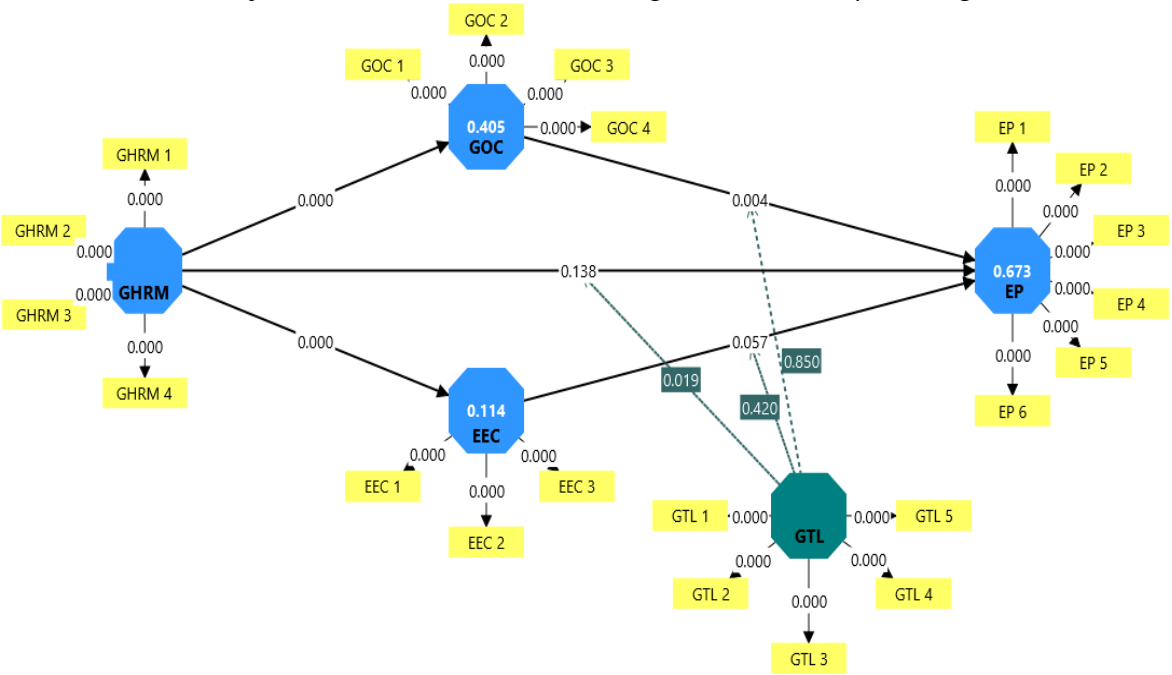


Figure 3. Structural Model Analysis Placeholder

Table 11

Path	Original Sample (O)	Sample Mean (M)	Standard Deviation	T Statistics	P Values
EEC → EP	0.144	0.155	0.075	1.904	0.057
GHRM → EEC	0.338	0.353	0.092	3.662	0.000
GHRM → EP	0.143	0.154	0.097	1.482	0.138
GHRM → GOC	0.636	0.649	0.060	10.673	0.000
GOC → EP	0.331	0.308	0.114	2.890	0.004
GTL → EP	0.328	0.333	0.111	2.939	0.003
GTL x EEC → EP	0.061	0.078	0.075	0.806	0.420
GTL x GHRM → EP	-0.202	-0.209	0.086	2.345	0.019

Table 11 Explains about which hypotheses are accepted and which hypotheses are rejected by indicating the values of path coefficient, the sample means, standard deviation, T value, and P values.

Path Coefficient

The results of the hypothesis testing based on the path coefficients obtained from the structural model are shown in this section. The significance of each link was assessed using the standardized path coefficient (β), t-values and p-values obtained from the bootstrapping procedure.

H1: Green Human Resource Management (GHRM) and Environmental Performance (EP)

The data suggest that the association between GHRM and Environmental Performance is statistically not significant ($\beta = 0.143$, $t = 1.482$, $p = 0.138$). H1 is not supported, as p-value is greater than threshold 0.05. This demonstrates that GHRM has no direct significant effect on environmental performance.

H2: The Mediating Role of Employee Environmental Commitment (EEC).

The study studied the mediating effect of Employee Environmental Commitment (EEC) in the relationship between Green Human Resource Management (GHRM) and Environmental Performance (EP). The findings demonstrate that GHRM has the favorable and significant impact on EEC. There was no significant association between EEC and EP ($p = 0.057$). The mediation is not significant yet the p-value is marginally above the conventional .05 threshold indicating a weak or borderline effect. And H2 is not supported.

H3: Green Organizational Culture (GOC) as a mediating effect

The results show that GHRM has a significant impact on Green Organizational Culture ($\beta = 0.636$, $t = 9.463$, $p = 0.000$) and GOC has a considerable positive impact on Environmental Performance

($\beta = 0.331$, $t = 2.898$, $p = 0.004$). Both routes are crucial, therefore GOC has an effect in mediating. Hence, H3 is accepted.

H4a: Moderating role of Green Transformational Leadership (GTL) on GHRM–Environmental Performance relationship

The interaction effect of GHRM and GTL on Environmental Performance is statistically significant ($\beta = -0.202$, $t = 2.345$, $p = 0.019$). However, the coefficient is negative and this implies that GTL decreases the relationship between GHRM and Environmental Performance. The moderating effect is substantial statistically but in the opposite direction than hypothesized. Therefore, H4a is not supported.

H4b: Moderation effect of GTL on the link between GHRM and Employee Environmental Commitment

The interaction effect was not significant ($\beta = 0.061$, $t = 0.807$, $p = 0.420$). The p-value is greater than 0.05, H4b is not supported.

H4c: GTL as mediator between GHRM and Green Organizational Culture

The results indicate that the interaction effect is not statistically significant ($\beta = -0.022$, $t = 0.189$, $p = 0.850$). Therefore, H4c is not supported.

Discussion

This chapter situates the results in the broader theoretical and empirical context of organizational sustainability.

Hypothesis 1 (H1): The results did not support the stated hypothesis since GHRM does not have a statistically significant direct effect on Environmental Performance. It demonstrates that simply implementing green human resource strategies may not be sufficient to bring about significant improvement in environmental performance.

Hypothesis 2 (H2): The empirical results showed that the mediating effect of Employee Environmental Commitment was statistically insignificant. Green Human Resource Management positively related to Employee Environmental Commitment, however, the indirect influence through employee commitment didn't significantly improve Environmental Performance.

Hypothesis 3 (H3): The empirical data strongly support this hypothesis. Green Organizational Culture significantly mediates the association between GHRM and Environmental Performance, suggesting that GHRM significantly enhances environmental performance through the creation of organizational principles, shared attitudes, and cultural norms that support environmentally responsible behavior.

Hypothesis 4a (H4a): The moderating effect of Green Transformational Leadership is significant, but contrary to the hypothesis, the interaction effect is negative. This means that at high levels, Green Transformational Leadership dilutes the beneficial association between GHRM and Environmental Performance.

Hypotheses 4b and 4c (H4b, H4c): The empirical results indicated that the moderating links were not statistically significant. The absence of meaningful moderation shows that GTL does not have a substantial moderating function between the relations of GHRM with EEC or GOC. GHRM has a significant effect on employee commitment and organizational culture irrespective of the leadership style.

Conclusion

The aim of this study is to explore the effect of Green Human Resource Management (GHRM) on Environmental Performance (EP) with the mediating effect of Employee Environmental Commitment (EEC) and Green Organizational Culture (GOC) and the moderating effect of Green Transformational Leadership (GTL). The objective of this research was to build a holistic understanding of the organizational mechanisms through which GHRM contributes to environmental sustainability using Partial Least Square Structural Equation Modelling (PLS-SEM) on data collected from employees in Pakistan.

The results indicate that GHRM does not have a direct effect on Environmental Performance. Investing in environmental recruitment, training, performance management, and rewards does not guarantee immediate quantitative gains. Rather, the influence of GHRM is based on organizational processes via which these practices change employee behavior. The critical path of GHRM on Environmental Performance among the mediating variables tested was Green Organization Culture. Environmental sustainability is achieved when green HR practices are embedded within the values, norms, and daily activities of the firm.

Implications for Theory

The study makes several important theoretical additions to the growing literature on GHRM, EP, GOC, EEC, and GTL. This study expands prior understanding of the organizational mechanisms via which Green Human Resource Management promotes environmental sustainability.

Managerial Implications

The study reveals that green human resource management alone does not increase environmental performance. Managers should not introduce green HR initiatives in isolation. Instead, GHRM should be embedded in an overall organizational sustainability strategy linking recruitment, training, performance management, remuneration systems, leadership practices, and organizational culture with clearly defined environmental goals.

Limits of the Study

First, the study was cross-sectional, obtaining data at one time point, which does not allow for the determination of causal relationships or the observation of changes over time. Second, the research was conducted in the banking industry of Pakistan; results may not be generalizable to manufacturing, public sectors, or multinational firms in different contexts. Third, data were collected by a self-administered questionnaire based on respondent perspectives, making it sensitive to common method and social desirability biases. Fourth, the model omitted variables such as environmental strategy, green innovation, and institutional pressure, which could provide a better explanation of organizational environmental performance.

Further Research Direction

Longitudinal research methods should be used to explore how the links between GHRM, organizational culture, employee commitment, and Environmental Performance evolve over time. Researchers are also encouraged to apply the proposed conceptual model to other industrial sectors such as manufacturing, healthcare, higher education, telecommunication, logistics, and public sector organizations to gain insights into contextual aspects that influence GHRM success.

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