Research Journal of Psychology (RJP)

Online ISSN: 3006-7219
Print ISSN: 3006-7200
Volume 3, Number 2, 2025, Pages 527 – 541
Journal Home Page
https://ctrjournal.com/index.php/19/index

Green HRM and Environmental Performance; the Role of Green Transformational Leadership and Green Innovation

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ARTICLE INFO

Article History:

Received:	*April*	*16, 2025*
Revised:	*May*	*24, 2025*
Accepted:	*June*	*01, 2025*
Available Online:	*June*	*05, 2025*

Keywords:

Green Human Resource Management, Green Innovation, Environmental Performance, Green Transformational Leadership and Resource-Based View

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ABSTRACT

This study investigates the impact of Green Human Resource Management (GHRM) on Environmental Performance (EP) in small and medium-sized enterprises (SMEs), with Green Innovation (GI) as a mediating variable and Green Transformational Leadership (GTFL) as a moderator. Rooted in the Resource-Based View (RBV) and Ability-Motivation-Opportunity (AMO) theory, the research aims to explore how internal organizational capabilities, specifically HRM practices and leadership, contribute to sustainability through innovation. Although large firms have dominated the sustainability discourse, this study redirects attention toward SMEs, which often lack formalized systems but hold significant environmental impact potential. A quantitative, cross-sectional research design was employed using structured questionnaires administered to 530 managers and employees across SMEs in Pakistan. After data screening, 290 valid responses were analyzed using Structural Equation Modeling (SEM). Measurement reliability was confirmed through Cronbach's alpha and composite reliability, while validity was established via AVE and discriminant validity metrics. Hypotheses were tested to examine both direct and moderated relationships. The findings reveal that GHRM significantly enhances EP and that GI partially mediates this relationship. GTFL significantly moderates the effect of GHRM on GI, indicating that leadership enhances the translation of HR practices into innovative green outcomes. However, GTFL does not significantly moderate the direct relationship between GHRM and EP or between GI and EP, suggesting that its influence is more salient in fostering innovation rather than directly affecting environmental outcomes. The study contributes to the sustainability literature by elucidating the pathways through which GHRM affects EP, emphasizing the critical roles of innovation and leadership. Implications are offered for SME managers and policymakers seeking to embed environmental strategies within organizational systems.

Introduction

Over the last decade, environmental issues have threatened the global business environment; hence, organizations have had to integrate sustainability into their strategies. Climate change, resource scarcity, and environmental pollution are the factors that affect the economy and society and force firms to make changes and implement eco-efficient strategies (Jabbour & de Sousa Jabbour, 2016). These challenges require a radical change in the business processes, culture, and management, especially that of the SMEs, to ensure sustainable development. Small and medium enterprises are a large part of the world's business and have a big collective effect on environmental pollution since they often waste resources and do not pay enough attention to environmental problems (Rizvi & Garg, 2021). Nevertheless, adopting green management practices in SMEs is challenging due to a shortage of funds and resources and less emphasis on sustainability than in large firms.

Green Human Resource Management (GHRM) has become a vital approach to enhancing environmental management within organizations. GHRM integrates environmental management concepts into the different HRM processes, like selection, training, appraisal, and reward systems, to manage the employees in a way that they contribute to the organizational environmental strategy (Renwick et al., 2013). Through establishing environmental considerations in human resource management, organizations can develop the green capabilities of employees, encourage them to act within the framework of green behavior and enable them to develop their innovations and contribute to the organization's environmental performance (EP) (Longoni et al., 2018). GHRM is not merely a set of activities that can be implemented; it represents a strategic attempt to create an organizational culture that includes sustainability within its boundaries (Jackson & Seo, 2010). Still, the effective use of GHRM is greatly influenced by the leadership culture that exists in the organization.

Green Transformational Leadership (GTL) is significant in developing GHRM and green innovation (GI). Transformational leaders make their employee's vision a reality through communicating a vision that is both creative and sustainable (Chen et al., 2014). Unlike transactional leadership centered on reward and punishment, GTL is a visionary, value-based system encompassing higher-order goals, including environmental stewardship (Mohsin et al., 2021). Not only do these leaders affect change in the individual, but they are also important in changing an organization's culture around GI and performance. Thus, GTL can help leaders foster the green behaviour of employees, develop new green products and services, and make employees' value systems consistent with the organizational vision of sustainability (Li et al., 2020).

EP research focusing on the relationship between GHRM and GI is very important. GI entails introducing new or improved processes, products, and practices that decrease environmental impacts (pollution, waste, consumption of resources) and simultaneously improve organizational performance (Asadi et al., 2020). Companies that encourage GI are more likely to earn competitive advantages as markets become increasingly green. The company's human resources are GI-driven. Employees' knowledge, skills, and competencies support any innovation process and, when in line with environmental goals, become a powerful driving force for sustainability (Jabbour et al., 2019).

Nevertheless, the literature on the association between GHRM, green leadership, and GI is limited. Recognition exists of the positive effects of GHRM practices on EP, but the mechanisms by which this occurs remain unclear. To the best of the author's knowledge, no previous published research has addressed, on the one hand, the role of GHRM in GI and, on the other, the leadership that

mediates that relation (Rana et al., 2022). Specifically, this gap is evident where sustainability studies have been conducted least in SMEs whose high environmental impact is noticed as least a priority. Nonetheless, while big companies establish rigorous systems and professional experience in implementing GHRM and green leadership, SMEs have fewer resources and professional experience. Hence, this study seeks to appreciate the significance of GHRM and leadership for GI among SMEs to facilitate the creation of a blueprint for GI across industries.

The RBV and the AMO theories are used to develop a theoretical framework for analyzing the relationship between GHRM, leadership, and EP. Based on the RBV, firms can attain sustainable competitive advantage by deploying valuable, rare, immobile, and inimitable resources (Barney, 1991). From an environmental perspective, the impact of GHRM practices on green performance is significant. These practices, aimed at building green competencies in employees, transform them into valuable assets for structuring GI and improving the firm's EP (Renwick et al., 2013). AMO theory developed by Appelbaum et al. (2000) helps to understand this impact. Holding out green abilities and encouraging green behavior and innovation necessitates GHRM practiced for developing green abilities through recruiting and training, boosting the motivation level through rewards and performance management and green opportunities through participation in green project decision making. Yong et al., (2019) concluded that employees join environmental initiatives therefore the sustainability behavior of the firm boosts.

Despite the theoretical support, the empirical examination of the impact of GHRM on EP, especially through the lens of GI and leadership, still needs to be explored. Very few theoretical studies specifically investigate the impact of GHRM on EP (particularly through GI and LEAD), and field studies are virtually nonexistent. Previous studies have occurred in larger organizations where formal structures and resources more readily exist to support GHRM initiatives (Paillé et al., 2020). On the other hand, when implementing such practices, SMEs tend to run into financial constraints and lack of expertise regarding sustainability. Since SMEs are a significant part of global businesses and make a huge contribution to environmental degradation, they also possess enormous untapped potential in sustainability transformation if the right strategy is adopted (Buysse & Verbeke, 2003); this makes SMEs fertile ground for research. This paper fills a gap in the existing literature by examining how GHRM practices can help shape GI and EP in SMEs, particularly emphasizing green transformational leadership as a moderating factor. This research is significant for several reasons. This first deals with the existing need for empirical evidence on the effectiveness of GHRM in fostering GI in SMEs. It also allows us to further our understanding of how green transformational leadership could amplify the impact of GHRM on EP. It also offers insights into how GI can mediate the relationship between GHRM and EP, suggesting that innovation is critical in linking human resource practices to sustainable outcomes.

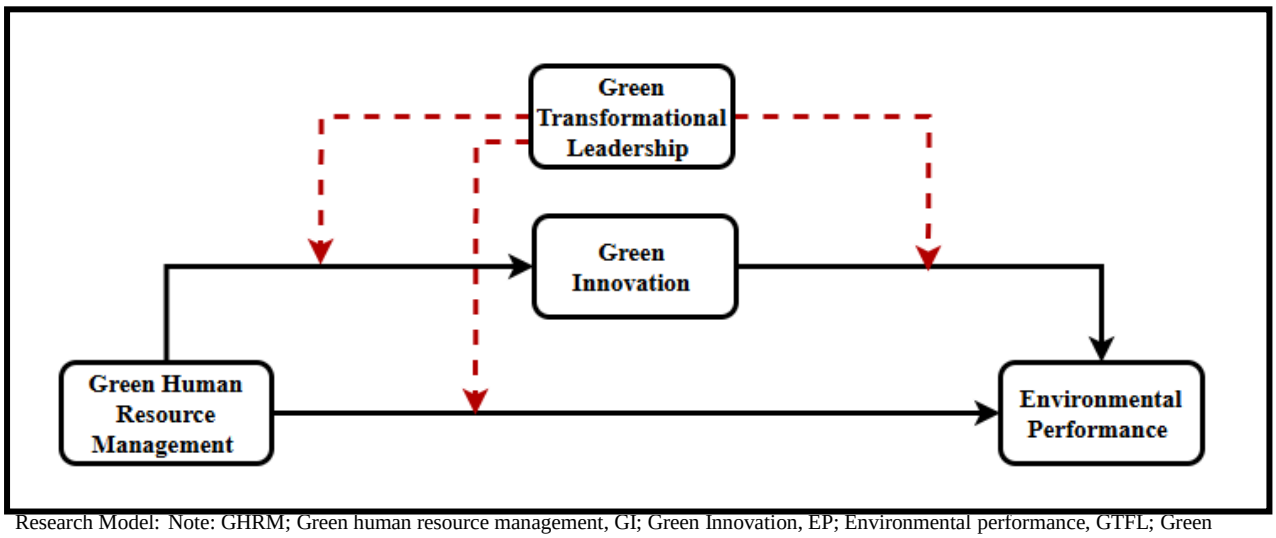
This research will provide valuable findings for its use in theoretical and practical contexts. The study shall advance the knowledge base of GHRM, GI, and leadership by identifying relationships among the three in SMEs. This research will offer policy advisers and SME managers guidelines for implementing GHRM and leadership strategies to encourage GI and enhance organizational EP. more; the study will be relevant not only and alone but also to large companies and other sectors in terms of embracing human resource management, leadership, and innovation to realize sustainability objectives.

Literature Review

Theories

The Resource-Based View (RBV) theory specifies that a firm's internal resources, such as human capital, can be a sustainable source of competitive advantage if they are valuable, rare, inimitable and have no perfect substitutes (Barney, 2001). Regarding GHRM, employees' sustainability-oriented green competencies enhance the firm's competitive advantages. Elements of sustainable human capital management also play a significant role in establishing a green human resource management system by creating environmentally sustainable employee resources, thus improving GHM organizational environmental outcomes such as green hiring, training and development processes. According to the RBV framework, human resources are among the most useful in promoting GI. Organizations can thus develop their employee's green abilities to reinforce the organization's capability to innovate in closed-down environmentally sustainable ways. The study reveals that the organizations that practice sound GHRM are likely to enhance GIs that are capable of enhancing the environment's performance compared to meeting the demands of green stakeholders (Renwick et al., 2013).

The AMO theory, developed by Appelbaum et al. (2000), suggests that employee performance is a function of three key factors: these precursors are: ability, motivation and opportunity. When used in GHRM, the four principles of the AMO framework suggest that organizations can improve their employees' EP by equipping them with knowledge (ability), encouraging them (motivation), and offering them a chance to participate in environmental processes. From a theoretical viewpoint, the AMO theory helps relate the GHRM practices to EP. By providing environmental training to employees, providing incentives for environmentally correct behavior, and involving employees in environmental activities, organizations can develop a robust human capital resource that is ready, willing, and able to contribute to GI activities. Evidence has revealed that AMO-aligned GHRM practices help firms enhance EP and organizational employee participation in sustainability (Jabbour & de Sousa Jabbour, 2016).



Research Model: Note: GHRM; Green human resource management, GI; Green Innovation, EP; Environmental performance, GTFL; Green transformational leadership

The Role of Leadership in Sustainability

The above literature review shows that transformational leadership has a central role in creating a sustainable organizational culture. Having a vision of the environment motivates leaders to make

their subordinates comfortable practicing environmentally friendly behavior, improving organizational improving performance. organizational Avolio and Bass (1995) define transformational leadership as leaders' need to come up with a vision of the environmental surroundings, create and inspire innovation, and help others own up to the cause and management of sustainability. Two recent studies reveal that transformational leadership positively impacts GI, as leaders influence the social integration of employees' values related to organizational environment organizational objectives (Mohsin et al., 2021).

Most scholars have proposed a relationship between transformational leadership and GHRM. It is argued that by example, direction, and climate, transformational leaders can promote implementing GHRM practices. Green leaders who are proactive in enhancing green outputs encourage their teams to practice green creativity so that organizations can deliver organization the intended Ecology outcomes (Rizvi & Garg, 2021).

Hypothesis Development

GHRM and Environmental Performance

In recent years, the discourse surrounding organizational sustainability has increasingly drawn attention to the development of internal competencies that support environmental responsiveness. Green Human Resource Management (GHRM), as a strategic configuration of practices that embed environmental considerations into employee management, has emerged as a salient enabler of such responsiveness. Instead of beginning with a conclusive claim regarding its influence, the relationship between GHRM and environmental performance can be approached by recognizing that GHRM encompasses various dimensions, green ability, green motivation, and green opportunity, which are theoretically anchored in the Ability-Motivation-Opportunity (AMO) framework (Appelbaum et al., 2000). Within this paradigm, firms build employee competencies through targeted recruitment and green training (green ability), foster intrinsic and extrinsic motivation using green rewards and performance appraisal systems (green motivation), and ensure participatory engagement through green-oriented opportunities (green opportunity) (Jabbour & de Sousa Jabbour, 2016; Paillé et al., 2020). The relevance of these dimensions to environmental performance lies in their potential to shape employee behaviors in ways that align with sustainability goals. Yet, such influence may not manifest uniformly; for instance, empirical studies indicate that while green ability and motivation are positively associated with environmental performance, the role of green opportunity can be ambiguous or context-dependent (Awan et al., 2022). Thus, it is essential to hypothesize the relationship between each GHRM component and environmental outcomes not as fixed or axiomatic but as empirically investigable within specific organizational contexts.

Building upon the preceding conceptual delineation, the link between GHRM practices and environmental performance can also be situated within the broader theoretical landscape of the resource-based view (RBV). RBV posits that internal capabilities, when rare, valuable, and inimitable, can provide firms with sustained competitive advantage (Barney, 2001). In this regard, GHRM practices can be viewed as a strategic resource that cultivates human capital uniquely attuned to environmental challenges. Empirical work further corroborates the idea that GHRM influences environmental performance both directly and indirectly, especially when mediated by green innovation, a construct encompassing environmentally conscious process and product developments (Renwick et al., 2013; Zhang et al., 2020). Firms adopting GHRM are more likely to invest in eco-innovative initiatives, such as reducing pollution through green processes or developing recyclable products, thereby enhancing their overall environmental performance (Mousa & Othman, 2020).

Nevertheless, this dynamic is not linear; green innovation may serve as a critical mechanism through which GHRM influences environmental outcomes, suggesting a mediated pathway rather than a simple causal effect. Therefore, the following hypothesis is proposed: Green human resource management practices, through the dimensions of green ability, green motivation, and green opportunity, are positively related to environmental performance, with green innovation serving as a mediating variable. This hypothesis acknowledges the multi-faceted and interactive nature of the GHRM-environmental performance relationship, consistent with contemporary findings in sustainability and organizational behavior literature (Awan et al., 2022; Rizvi & Garg, 2021).

Mediating role of Green Innovation

In contemporary organizational strategy, the intersection between environmental sustainability and human resource practices continues to draw scholarly and managerial interest. As firms increasingly seek ways to integrate environmental considerations into their internal operations, Green Human Resource Management (GHRM) has been conceptualized as a strategic mechanism to develop environmentally responsible behaviors and capacities among employees (Renwick et al., 2013).

GHRM works through three main channels, green ability, green motivation, and green opportunity, which are explained in the Ability-Motivation-Opportunity (AMO) model (Appelbaum et al., 2000). Green ability pertains to the acquisition of skills and knowledge via environment-focused recruitment and training; green motivation utilizes appraisal and reward systems to encourage environmentally responsible behavior; and green opportunity facilitates participatory decision-making and active employee engagement in environmentally friendly practices (Jabbour & de Sousa Jabbour, 2016; Paillé et al., 2020). As much as these practices are designed to create an impact, the way these practices translate to measurable performance requires further study. One emerging idea within this discourse is green innovation, defined as process and product innovations designed to reduce environmental damage (Zhang et al., 2020). With the adoption of GHRM practices, companies may not only encourage individual pro-environmental behaviors but also establish organizational frameworks that support green innovations. This leads to an enhancement of environmental performance through a reduction in emissions, resource conservation, and the promotion of sustainable production (Asadi et al., 2020). Therefore, in this case, it is more relevant to ask if green innovation acts as a medium through which GHRM practices impact environmental performance instead of assuming a direct relationship.

Strategic management develops theoretical and empirical frameworks justifying the role of green innovation in the framework of GHRM and environmental corporate performance. The Resource-Based View (RBV) suggests that organizations acquire competitive advantage based on unique and difficult to replicate internal strengths (Barney, 2001). GHRM as a strategic capability develops human capital integrated with ecological values which enables a culture of innovation towards environmental challenges (Kim et al., 2019). Empirical studies show that firms with strong green HR practices deeply cultivate greater green innovative activities which correlate with key environmental performance indicators such as energy consumption and waste generation (Mousa & Othman, 2020). Moreover, by institutionalizing green training, assessing performance with green benchmarks, and offering governance frameworks for green participative projects, organizations allow for the design and implementation of operational and environmental intersections that are needed to green operational practices (Yusoff et al., 2020). In this interplay, green innovation serves, in a dynamic sense, not only as the result but also as the mediation process through which GHRM is transformed into real environmental value. Such agreement also

supports the conclusions of Awan et al. (2022) who outline the impact of green innovation in connecting green human resource management with improved environmental performance in small and medium enterprises. In order to advance empirical insights and assess the accuracy of this conceptual framework, the following hypothesis is put forward: A model that depicts green innovation as a mediator in the relationship between green human resource management practices and environmental performance is formulated. This proposition recognizes the multi-faceted complexity of strategic environmental management and highlights the need to reconceptualize green innovation as a structural mechanism through which internal human resource systems shape organizational sustainability, rather than solely as an outcome of high performance.

GTFL as moderator

Leadership remains a central construct in organizational studies, particularly in the context of sustainability transitions where behavioral change, innovation, and performance outcomes must be aligned with ecological imperatives. Green Transformational Leadership (GTL) is a comparatively new form of leadership highlighted by pro-environment values, inspiration and motivation, and individualized consideration attention across organizational levels and echelons (Chen et al., 2014; Kusi et al., 2021). GTL, like transformational leadership, seeks to motivate, and pay attention to the employee's cognition and emotions around green initiatives at the workplace. GTL focuses on transformational leadership contingencies that influence the success of sustainability initiatives in the organization, especially regarding sustainability frameworks that include GHRM. GHRM is inclusive of green training, green performance appraisal, and participative environmental management which aim at influencing environmental performance (EP) and green innovation (GI) (Renwick et al., 2013; Paillé et al., 2020). However, the organizational climate shaped by leadership context may modify the strength and consistency of these impacts. GTL may reinforce these relationships by strengthening employee vision, providing ecological leadership, and modeling sustainability values (Awan et al., 2022). The efficacy of GHRM in promoting GI and enhancing EP improves when clear environmental objectives are set with assigned team autonomy to devise innovative approaches to achieve objectives. Hence, the relationship connecting GHRM and performance metrics is likely to depend on whether and how strongly the GTL is manifest within the firm.

Extending this conceptual argument, it is also essential to consider how GTL moderates' relationships not only between GHRM and environmental outcomes but also between green innovation and performance. Often linked to change in the form of product or process innovations which reduces harmful effects on nature, green innovation tends to need strategic guidance to overcome inertia, procure funds, and resource management (Zhang et al., 2020; Wang et al., 2020). In such cases, GTL acts not merely as a symbolic head but as a pragmatic enabler who allows teams to transform green capabilities into innovations with actual environmental impacts. The existence of GTL may increase the benefits of GI on EP by cultivating a positive environment toward sustained improvement and innovation in green issues (Li et al., 2020). Furthermore, in contexts of low or inconsistent GTL, the implementation of GHRM tends to lead to unmet expectations, in innovation or environmental performance, causing those goals to be underachieved. On the other hand, strong GTL seems to close the implementation gap so that GHRM results in innovative processes which then translates into actual environmental benefits. Empirical evidence supports this reasoning as well. Awan et al. (2022) reported that GTL had a significant effect on the green ability-green innovation relationship in Pakistani SMEs, arguing for leadership's reinforcing role. Consequently, to optimally contour this dynamic, the following hypothesis is set forth: "Green Transformational Leadership (GTL) moderates the relationships between Green Human Resource Management (GHRM) and Environmental Performance (EP),

GHRM and Green Innovation (GI), as well as between GI and EP." This hypothesis highlights that GTL bypasses "sustainability as a goal" and GTL "merely" guides focus by strategically steering the institution and simultaneously strengthens the organizational structures to achieve the sustainability objectives leveraging workforce innovations.

Table 1: Prior studies on GHRM-EP

Context	Predictors	Outcomes	Findings
SMEs in Pakistan	GHRM Practices (Green Ability, Green Motivation, Green Opportunity)	EP	GHRM practices directly enhance EP by promoting green skills and opportunities (Awan et al., 2023).
Manufacturing and Service Industries	Green Training and Development	Employee Engagement in Environmental Goals	GHRM practices improve waste management, energy efficiency, and align performance management with eco-goals (Renwick et al., 2013).
General Organizational Studies	GHRM Practices	Organizational Sustainability	GHRM is effective for minimizing environmental impacts and promoting resource optimization (Paillé et al., 2020).
High-Performing Firms	GHRM Practices and Green Leadership	GI	Green leadership supports the application of GHRM to foster innovation and enhance sustainability (Mohsin et al., 2021).
Environmentally Conscious Organizations	Green Process and Product Innovation	Environmental and Economic Outcomes	GI reduces waste and energy consumption, leading to improved organizational performance (Asadi et al., 2020).

Methodology

We have proposed the research method for this study, which aims to clarify the mediating effect of GI between green human resource management and EP in small and medium-sized enterprises. These SMEs, often overlooked in sustainability discussions, play a crucial role in the economy's development and are in need of support. Our research, conducted through structured questionnaires, places a particular emphasis on these companies, aiming to understand how GHRM and leadership can direct attitudes and behaviours toward the environment and encourage GI.

A survey-based data collection method was chosen to gather primary data from SME employees and managers, as this method efficiently collects responses from a large sample size was designed to measure the main variables of interest: GHRM practices, GI and EP. All the questionnaire items were adopted from prior surveys with reliability and validity co-efficient scores. For instance, the GHRM items were developed by Renwick et al. (2013) and included greens for recruitment, training and rewards; GI was measured from the items by Zailani et al. (2015) and included product and process innovations. EP was captured through items that measure waste minimization, resource use efficiency and emission control adopted by Roscoe et al. (2019). Each response was measured on a five-point Likert scale, a widely accepted method in social science research, where one denoted strongly disagree, and five strongly agree. This scale not only allows respondents to give fine-grained ratings about how much they agree with each statement, but also provides a clear

and easily interpretable measure of their attitudes and perceptions. A preliminary survey was conducted on a small sample of SME managers to edit the survey questions and clarify their wording and structure.

The target population for this research was selected from SMEs in Pakistan's manufacturing, services, and retail sectors. These SMEs were chosen through convenience sampling since only firms interested in sustainability practices were sought. The authors administered 530 questionnaires to the managers and the employees, and 317 were completed and returned, resulting in an impressive response rate of 54.71%. The screening eliminated otherwise invalid responses, and the study sample for analysis remained 290 respondents. This sample size is ideal for statistical analyses using structural equation modelling (SEM), which requires at least 200 participants' samples.

Data analysis

Primarily analysis

An initial examination of the data shows that the basic criteria needed for the creation of a multivariate statistical model was observed, substantiating that the study underwent rigorous scrutiny. In the first stage, self-reporting surveys with cross-sectional designs are examined for possible common method bias (CMB) issues. With regard to the CMB assessment using the variance inflation factor (VIF), all items fell well below the threshold of 5. Therefore, it seems CMB did not threaten the financial system much (Kock, 2015). They support the idea that the data is reliable which in turn suggests that common method bias did not have a major impact on how the constructs are related. The presence of no missing values in the data adds to the legitimacy of the statistical analyses performed. Complete data prevents biases or imputation issues from affecting the results which protects the internal validity (Tabachnick \& Fidell, 2013). A total of 315 responses collectively shows that the sample is not only adequate, but well above the necessary minimum for SEM analysis which is set at 200 ‘eyeballed’ values (Hair et al., 2017). A large sample size strengthens the analysis and sure that the outcomes are relevant for SMEs. Skewness and kurtosis helped determine whether the data followed a normal pattern. Since all the values for skewness (-2 to +2) and kurtosis (-7 to +7) are within the accepted range, the data shows a normal distribution (Byrne, 2010). Because of this, SEM which is a parametric approach, needs the underlying data to be multivariate normal in order to produce reliable and accurate estimates.

Variance inflation factor and factor loadings

Table 2: Regression Weights & VIF

Variables	Items	VIF	Factor Loadings
Environmental Performance (EP)	EP1	2.803	0.862
	EP2	2.409	0.850
	EP3	2.957	0.874
	EP4	2.948	0.879
	EP5	2.383	0.814
Green Human Resource Management (GHRM)	GHRM2	4.001	0.799
	GHRM3	3.826	0.775
	GHRM4	2.651	0.797

	GHRM5	4.644	0.818
	GHRM6	2.310	0.753
	GHRM7	3.776	0.838
	GHRM10	2.280	0.782
	GHRM11	1.974	0.737
	GHRM13	1.738	0.707
Green Innovation (GI)	GI1	3.998	0.893
	GI2	4.881	0.896
	GI3	3.985	0.885
	GI4	3.790	0.893
	GI5	4.772	0.859
	GI6	4.523	0.909
	GI7	4.270	0.836
Green Transformation Leadership (GTFL)	GTFL1	1.859	0.859
	GTFL2	2.153	0.876
	GTFL3	1.783	0.852

The preliminary analysis of the measurement model confirms the validity and reliability of the constructs used in this study. All items show strong factor loadings over 0.70 (Hair et al., 2017). This indicates that each item effectively associates with its latent variable. For Environmental (EP), the items ranged between 0.814 to 0.879 which surpasses minimum thresholds along with GHRM from 0.707 to 0.838, GI from 0.836 to 0.909, and GTFL from 0.852 to 0.876. Values demonstrate high internal consistency alongside convergent validity which determines that all the GHRM items measure the same phenomenon. Concerning multicollinearity, the variance inflation factor (VIF) values for all items below 5 (Kock, 2015). This provides evidence that multicollinearity is absent alongside over correlation which strengthens factor predictive validity. GHRM items showed higher VIF with GHRM5 at 4.644 which is above average but still supports a well specified model free from indicator redundancy. Findings confirm that GHRM, EP, GTFL, and GI constructs are accurately measured ensuring reliability for structural equation modeling. The evaluation of item loadings as well as multicollinearity checks is in accordance with the recommendations of quantitative research and enhances the reliability and the interpretability of the obtained results (Byrne, 2010; Tabachnick & Fidell, 2013). From this, the measurement model demonstrates its theoretical soundness and empirical adequacy in testing the hypothesized relationships in the research framework.

Reliability Statistics

Table 3: Reliability values

Variables	**Cronbach's alpha**	**(rho_a)**	**(rho_c)**	**(AVE)**
Environmental Performance (EP)	0.909	0.914	0.932	0.733
Green Human Resource Management (GHRM)	0.920	0.926	0.933	0.607
Green Innovation (GI)	0.952	0.957	0.961	0.778
Green Transformation Leadership (GTFL)	0.828	0.829	0.897	0.744

Average variance extracted (AVE)

Discriminant Validity

Table 4: HTMT Ratio

	EP	GHRM	GI	GTFL
Environmental Performance (EP)				
Green Human Resource Management (GHRM)	0.422			
Green Innovation (GI)	0.540	0.520		
Green Transformation Leadership (GTFL)	0.428	0.848	0.591	

The reliability and validity statistics affirm the robustness of the measurement model. All constructs exhibit high internal consistency, with Cronbach's alpha values exceeding the recommended threshold of 0.70 (Hair et al., 2017), ranging from 0.828 (GTFL) to 0.952 (GI). Composite reliability (ρ_c) values also surpass 0.70, indicating (see table 3) convergent reliability. Average Variance Extracted (AVE) values are all above 0.50, confirming adequate convergent validity (Fornell & Larcker, 1981). Additionally, Heterotrait-Monotrait (HTMT) ratios were below the 0.85 threshold (see table 4), confirming discriminant validity among constructs (Henseler et al., 2015), ensuring constructs are conceptually distinct and suitable for further structural analysis.

Hypotheses results

Table 5: Results

	Original sample	(M)	(STDEV)	T statistics	P values
GHRM -> EP	0.228	0.222	0.089	2.551	0.011
GHRM -> GI -> EP	0.110	0.110	0.038	2.923	0.003
GTFL x GHRM -> EP	0.049	0.053	0.064	0.764	0.445
GTFL x GHRM -> GI	0.105	0.139	0.052	2.567	0.015
GTFL x GI -> EP	0.003	-0.001	0.078	0.035	0.972

The hypothesis testing results reveal several significant and non-significant relationships. First, the direct effect of Green Human Resource Management (GHRM) on Environmental Performance (EP) is positive and significant (β = 0.228, p = 0.011), supporting the hypothesis that GHRM practices enhance EP. Furthermore, Green Innovation (GI) significantly mediates the relationship between GHRM and EP (β = 0.110, p = 0.003), indicating a partial mediation effect where GHRM improves EP through fostering innovation. The moderation analysis shows that Green Transformational Leadership (GTFL) significantly moderates the relationship between GHRM and GI (β = 0.105, p = 0.015), suggesting that leadership amplifies the influence of GHRM on innovation. However, GTFL does not significantly moderate the direct relationship between GHRM and EP (β = 0.049, p = 0.445), nor the GI to EP link (β = 0.003, p = 0.972), implying that leadership's influence is more pronounced in driving innovation than directly enhancing environmental performance outcomes.

Discussion

The primary aim of this study was to examine how Green Human Resource Management (GHRM) influences Environmental Performance (EP) in small and medium-sized enterprises (SMEs), considering the mediating role of Green Innovation (GI) and the moderating role of Green

Transformational Leadership (GTFL). Drawing on the Resource-Based View (RBV) and Ability-Motivation-Opportunity (AMO) theories, the study explored how internal human capital capabilities and leadership behaviors contribute to environmental sustainability.

The results confirm that GHRM impacts positively on EP. This is in agreement with previously published findings which have argued that HRM with a green scope, including, but not limited to, green recruitment, training, and rewards—can foster pro-environmental behaviors by providing appropriate green abilities, motivation, and opportunities at the workplace (Renwick et al., 2013; Paillé et al., 2020). The AMO framework supports this where employee performance is enhanced when there exists capability, motivation, and resources as a driver (Appelbaum et al., 2000). Therefore, GHRM can be understood as a strategic asset that augments an organization's capacity for transformative change towards sustainability (Barney, 2001). Furthermore, the study found that GI mediates the impact of GHRM on EP. This supports prior studies which identified innovation as a significant driver of desired environmental results. After adopting GHRM, an organization usually molds a favorable culture toward green innovation where employees are encouraged to propose new ideas and to make sustainable process changes (Zhang et al., 2020; Asadi et al., 2020). This finding is consistent with the RBV view in which GI is regarded as an antidote to competitive advantage because it is developed through strategic utilization of human resources and is difficult to replicate (Barney, 2001). GHRM, therefore, also shape behavior by exercising indirect influence through the creation of innovation as well as develop systemic capabilities that improve environmental performance.

The results demonstrate that GTFL has a strengthening moderation effect on the relationship of GHRM and GI regarding leadership. This supports the findings of lexicon Chen et al. (2014) and Kusi et al. (2021), which focus on the impact of transformational leaders on employee engagement towards collective environmental objectives. GTFL cultivates vision and empowers its constituents, which is crucial in transforming human resource management into innovative practices. Moreover, scholars like Li et al. (2020) argue that leaders who enforce environmental and green HRM policies can strengthen HRM's contribution by fostering psychological safety on innovation. Nevertheless, the analysis's results indicate that GTFL does not substantially moderate the GHRM and EP nor the GI and EP relationships. This may suggest that while leadership may enable innovative undertakings, its influence in the case of achieving environmental performance results may be indirect or much longer attitudinal changes. Perhaps, as put forward by Awan et al. (2022), EP responds more readily to outside driving forces such as meeting compliance standards or fulfilling customer expectations rather than from internal triggers. Also, it appears that the thrust of leadership influence is greatest during the beginning phases of innovation and much less during the operational phases associated with performance appraisal outcomes. Mohsin et al. (2021) support this reasoning where they propose that although leadership shapes organizational culture and behavior, the impact is not always observable without coordinated, systematic action to follow through.

Limitations and Future Directions

This study deepens our understanding of the Green Human Resource Management (GHRM) and Environmental Performance (EP) connections; however, it also has shortcomings which may emerge as avenues for further work. First, the use of cross-sectional data poses a challenge in establishing causality between the variables in question. While testing complex relationships using structural equation modeling is useful, capturing the temporal interplay between GHRM practices, Green Innovation (GI), and EP over time would be best approached with longitudinal studies (Paillé et al., 2020). There needs to be focused study on understanding the sustained impact of

GHRM initiatives on innovation cycles and environmental performance with a greater focus on time. Second, the scope of the study within Pakistani SMEs creates some concerns with the generalizability of the findings. Other regionally located SMEs may differ due to the regulatory landscape, cultural norms, or availability of resources that influence the adoption and impact of GHRM practices. Hence, further studies may consider replicating the study in different locations and industries to ascertain the resilience of the model in differing contexts and situational factors (Renwick et al., 2013). Third, the study proposed GI as a mediating variable and Green Transformational Leadership (GTFL) as a moderator, but seemingly overlooked many other possible important mediators and moderators. For instance, the culture of environmental sustainability within the organization could mediate the relationship between GHRM and EP (Jabbour & de Sousa Jabbour, 2016). The addition of these constructs would broaden the understanding of the ways in which HRM practices impact the environmental sustainability.

The GTFL moderating role was only partially validated. While it strengthened the connection between GHRM and GI, it did not meaningfully moderate the direct connections EP has with both GHRM and GI. This indicates leadership may have a more indirect enabling role in driving performance outcomes. Other leadership styles, for example green servant leadership or ethical leadership, may be more effective in providing consistent moderating influences on the stated framework's environmental performance outcomes (Chen et al., 2014; Mohsin et al., 2021). The study also did not go beyond self-reported measures, which is prone to common method bias. Although VIF values indicated that bias was not a major concern, incorporating multi-source data such as externally assessed performance metrics or supervisor ratings would strengthen the findings and diminish response bias.

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