Green Training, Recruitment, and Performance Management Driving Employee Green Behavior: Mediation by Green Self-Efficacy

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Abstract

Companies throughout the world have adopted Green Human Resource Management (GHRM) in response to the need of a strategic tool for encouraging pro environmental behavior. Sustainability's urgency is growing among staff members. Although other studies have looked into how GHRM practices affect company performance, not much have examined their direct effects on Employee Green attitude (EGB) through psychological processes in developing countries. This study examines how three GHRM practices Green Training, Green Recruitment, and Green Performance Management influence Employee Green Behavior (EGB), testing Green Self-Efficacy (GSE) as a psychological mediator. This was a cross-sectional survey of N = 360 employees from medium and large scale manufacturing organizations. Data was collected from departmental managers using multi item likert scale instrument and analyzed with structural equation modeling (SEM). A 5,000 sample bias corrected bootstrapping approach was further applied to evaluate indirect mediation pathways. Reliability for all constructs exceeded $\alpha = .80$. SEM indicated significant direct effects of Green Training ($\beta = .40$, $p < .01$), Green Recruitment ($\beta = .35$, $p < .01$), and Green Performance Management ($\beta = .47$, $p < .01$) on EGB. GSE had a positive effect on EGB ($\beta = .41$, $p < .01$) and partially mediated all three relationships. Model fit indices met recommended thresholds. The study integrates three core HR levers with a green self efficacy (GSE) in a single model and provides manufacturing sector evidence from an emerging economy context, a setting underrepresented in prior work. Findings guide HR

leaders to pair structural HR practices with efficacy-building micro-interventions to amplify green outcomes.

Keywords: Green Human Resource Management Practices; Green Training; Green Recruitment; Green Performance Management; Green Self-Efficacy; Employee Green Behavior; Manufacturing

Introduction

The manufacturing sector continues to be one of the largest contributors to environmental degradation, accounting for a major share of global energy consumption, greenhouse gas (GHG) emissions, and solid-waste generation. Manufacturing businesses account for about a third of all the world's energy, hence they significantly increase both air and water pollution, according to the International Energy Agency (2022). For countries like Pakistan, India, and China, the business serves a dual purpose: it is a major driver of economic expansion as well as a source of serious environmental issues. Managers and legislators face difficulty on how to maintain competitiveness while minimizing environmental footprints in a resource-limited economy (Yong et al., 2020; Ren et al., 2021).

Businesses have come to accept sustainable practices in reaction to increasing outside demands from governments, global supply chain allies, and more environmentally aware consumers. Legal compliance and technical innovations are also needed to solve sustainability issues. Employee behavior must change as their everyday activities decide if corporate sustainability policies are reflected in real environmental results (Pham et al., 2020; Luu, 2022). This has driven focus on Green Human Resource Management (GHRM), which therefore incorporates environmental goals into recruiting, training, and performance management systems. incorporating sustainability is more a part of company culture than a minor project (Ren et al., 2021).

The main idea in sustainability studies has changed along with employee green behavior (EGB), which is work-related and voluntary activities done by staff members to aid in attaining organizational sustainability objectives, include saving energy, reducing garbage, recycling, and participating in environmental initiatives in addition to less environmental damage (Yong et al., 2020; Pham et al., 2020). Recent research highlights that EGB is the micro foundation of corporate environmental performance; no matter how

advanced environmental management systems are, they depend on employees' will and capacity to act sustainably (Luu, 2022). Research consistently links GHRM practices to EGB, yet the mechanisms through which HR interventions influence individual behaviors remain underexplored, particularly in manufacturing sectors of emerging economies (Ren et al., 2021).

Within GHRM, three practices are most consistently identified as critical drivers of EGB. Recent work shows that green training improves both employee competencies and motivation, enabling workers to adopt sustainable practices at work and beyond (Pham et al., 2020; Yong et al., 2020).By hiring candidates with pro-environmental values, firms strengthen value congruence and ensure that new hires are predisposed toward EGB (Tang et al., 2021; Ren et al., 2021).

Aligning performance evaluation and rewards with environmental criteria ensures accountability and reinforces sustainable behaviors. Empirical evidence from 2020–2022 confirms that when environmental KPIs are integrated into appraisal systems, employees exhibit stronger green citizenship behaviors (Luu, 2022; Yong et al., 2020).

Although these practices have been studied individually, research after 2020 calls for examining their combined or bundled effect on EGB, recognizing that HR systems operate synergistically rather than in isolation (Ren et al., 2021).

Luu (2022) demonstrated that employees with high GSE were more likely to engage in both task-related and extra-role green behaviors, even under challenging circumstances. Similarly, studies in manufacturing and service industries show that HR interventions such as training and performance management improve EGB indirectly by building employees' confidence in their green capabilities (Pham et al., 2020; Yong et al., 2020).

Despite the growing attention, empirical studies integrating Green Training, Recruitment, and Performance Management with GSE as a mediator remain limited, particularly in emerging economy manufacturing contexts where environmental challenges are severe. Much of the recent work has been sector-specific or country-specific, leaving gaps in understanding how bundled HR practices interact with psychological factors to influence EGB (Ren et al., 2021). This study addresses this gap by examining how GHRM

practices shape EGB directly and indirectly through GSE, offering theoretical and practical insights for sustainable human capital management in manufacturing sectors.

Significance of the Study

This research makes both theoretical and practical contributions. Theoretically, it integrates structural HR practices and psychological mechanisms into a single model, thereby advancing GHRM and organizational behavior scholarship. Practically, it offers actionable insights for HR leaders in the manufacturing sector, who must design policies that not only institutionalize green practices but also empower employees psychologically to implement them. By demonstrating the dual importance of HR systems and self-efficacy, the study highlights how organizations can amplify their environmental performance and contribute to global sustainability agendas.

Objectives of the Study

1. To assess the direct effects of three core GHRM practices on Employee Green Behavior in manufacturing organizations.
2. To evaluate the mediating role of Green Self-Efficacy in translating GHRM practices into sustainable employee actions.
3. To provide empirical evidence from an emerging economy manufacturing context, thereby extending the scope of GHRM research beyond developed country settings.

Hypotheses (H1–H5)

1. H1: Green Training and Development directly influences Employee Green Behavior.
2. H2: Green Recruitment and Selection has a positive direct effect on Employee Green Behavior.
3. H3: Green Performance Management has a positive direct effect on Employee Green Behavior.
4. H4: Green Self-Efficacy has a positive effect on Employee Green Behavior.
5. H5: Green Self Efficacy mediates the relationship between Green Human Resource Management Practices and Employee Green Behavior.
6. H5a: Green Self Efficacy mediates the relationship between Green Training and Employee Green Behavior.

7. H5b: Green Self Efficacy mediates the relationship between Green Recruitment and Employee Green Behavior.
8. H5c: Green Self Efficacy mediates the relationship between Green Performance Management (GPM) and Employee Green Behavior.

Literature Review

Green HRM and Behavioral outcomes

Renwick et al., (2019) matches environmental objectives with staff, training, and performance systems. Via EGB, meta-analytic and review evidence reveal that GHRM improves environmental performance and green corporate citizenship behavior (Dumont et al. 2017).

Green Training and Development

Green training covers eco-process innovations as well as knowledge of energy conservation, waste segregation, pollution reduction. Companies that formalize hands-on environmental education assert that they have more employee participation in green projects and process eco-innovation (Pinzone et al., 2019).

According to recent studies, companies that support green training are more inclined to encourage environmentally friendly behaviors like waste reduction, energy conservation, and resource efficiency (Yong et al., 2020).

Pham et al. (2020) revealed how green education improves not only the technical capabilities of the personnel but also their readiness to act ethically toward the surroundings. This dual impact helps to increase both task-related actions like recycling and resource waste reduction as well as extra-role activities like volunteering for environmental initiatives. Training is therefore regarded as a direct force driving EGB in companies.

Luu (2022) says that training courses improve staff members' confidence in their capacity to promote sustainability, thereby raising their involvement in ecologically friendly initiatives. Rather than merely acquiring knowledge, green training aids in the growth of self-assurance and psychological readiness for green activities, as these results demonstrate.

According Yong et al. (2020), Malaysian manufacturing businesses with formal green-trained personnel showed higher EGB values. Also verified the conclusions of Pham

et al. (2020). The fact that Vietnamese firms adopting Organized green education saw more employee participation in environmental initiatives. These studies show especially in developing-country settings where environmental issues are acute how green education is a global means for sustainable conduct.

Finally, past research show that sustained culture arises from the long-term impact of green education. When companies include environmental education into their normal development plans, green approaches become ingrained as cultural norms rather than as passing projects (Ren et al., 2021).

Green recruitment and Selection

Recent studies (Yong et al., 2020) show that younger job searchers in particular look for companies expressly demonstrating environmental responsibility in their hiring materials. This shows how hiring not only brings in environmentally conscious personnel but also raises the company's reputation.

Ren et al. (2021) discovered that when employees see concordance between their own environmental beliefs and company policies, they are more likely to participate. Energy conservation and trash reduction are among voluntary green initiatives. Less stringent environmental regulations in growing countries rely mostly on employee-driven projects for long-term benefits. Outcomes are especially crucial; therefore, this alignment is.

Tang et al. (2021) noted that more applicant attraction was seen in recruitment advertisements featuring environmental rules, which subsequently produced more strong green workplace behaviors after hiring. This implies that Green Recruitment affects pre-employment attractiveness as well as post-employment behavior.

Better EGB among Malaysia's manufacturing companies was found by Yong et al. (2020) when green hiring policies were followed; similarly, studies in South Asia and China Even including performance and training into management show that green hiring needs accurately foretell employee-level environmental citizenship behavior (Luu, 2022; Ren et al., 2021). These findings emphasize how crucial green recruiting approaches are in industrialized nations as well as in resource-intensive areas of developing countries**.**

Luu (2022) argued that combining green hiring with techniques such shared vision and green leadership fosters group identity around sustainability, hence favoring EGB above

time. This long-term perspective emphasizes how recruiting is more than a transactional hiring event; rather, it is a strategic tool for cultural change.

Green Performance Management

Integrating environmental KPIs in goal setting, evaluation, feedback, and rewards strengthens green standards and promotes compliance (Arulrajah & Opatha, 2016; Paillé et al., 2019).

Pham et al. (2020) discovered that employees show more engagement in eco-innovative and resource-conserving projects when managers tie performance reviews to environmental objectives. Employees perceive green behavior as an absolutely critical part of job performance, therefore they include environmental outcomes as part of the official evaluation process rather than as elective. Therefore raising extra-role green activities as well as task-related ones.

Manufacturing staff showed significantly higher levels of EGB when performance management systems included environmentally friendly standards and incentives (Yong et al. 2020). This means that in addition to organizational commitment to sustainability, GPM provides tangible incentives for workers to engage in green activities.

Performance systems that acknowledge green contributions, according to Luu (2022), help workers believe they are more effective and belong to a sustainable company. This promotes a common vision and collective accountability for environmental results. GPM therefore acts both as a cultural driver of green identity inside businesses and as a behavioral control mechanism.

Research conducted in Asia and the Middle East reveal that companies implementing GPM systems particularly in energy-intensive industries saw statistically significant changes in worker pro-environmental behavior (Ren et al., 2021; Yong et al., 2020).

Green Self Efficacy

By providing mastery experiences (training), vicarious learning (role models), social persuasion (feedback), and supportive environments (performance systems), HR techniques can boost GSE (Luu, 2022; Pham et al., 2020). Ren et al. (2021) stressed that workers get more driven to participate when companies create GSE via experiential

learning, mentoring, and recognition. in both extra-role (voluntary) and in-role (job-required) environmental activities.

Thus, GSE functions as the psychological bridge between HR practices and behavioral outcomes. Pham et al. (2020) found that GSE partially mediated the effect of green training on employees' voluntary environmental behaviors in the hospitality sector. Similarly, Yong et al. (2020) reported that in manufacturing firms, employees with higher GSE were more responsive to green recruitment and performance initiatives, reinforcing EGB outcomes. These findings establish GSE as a consistent mediator in GHRM frameworks. Yong et al. (2020) suggested that organizations should embed GSE development into leadership training, job design, and organizational culture, making it a continuous process rather than a one-off intervention. Over time, institutionalizing GSE across teams can create a self-sustaining culture where employees feel empowered and motivated to practice EGB consistently.

Mediation Role of Green Self Efficacy

Training, hiring, and performance systems supply skills, cues, and incentives, but behavior materializes when employees believe they can act effectively. Prior findings show partial mediation of efficacy like constructs between HR inputs and pro-environmental outcomes (Norton et al., 2015; Luu, 2022). Ren et al. (2021) highlight that HR interventions may provide structural opportunities, but employees' self-belief in their capacity to act sustainably determines the strength of behavioral outcomes. Therefore, GSE acts as a psychological bridge, helping to negotiate the HRM–EGB relationship.

Recent research verifies that GSE helps to mediate the link between green training and EGB. Recent research shows that GSE mediates the link between EGB and green training. Pham et al. (2020) proved that although training increases workers' environmental knowledge, and awareness's influence on real green behavior is greater when employees come to believe in their capacity to take eco-friendly activities. Employees with high GSE were more likely to embrace sustainable habits picked up in training, therefore indicating that efficacy beliefs enhance the behavioral effect of training programs. Employees employed via green-focused hiring showed more EGB when they also said they had high self-efficacy, according to Young et al. (2020). This implies that GSE offers the

psychological resources required to convert intents into regular behaviors, hence reinforcing the HR–EGB link even if recruiting matches values.

Luu (2022) observed that GSE partially mediated the link between green performance management and EGB, implying that workers with greater efficacy are more responsive to appraisal and incentive schemes related to sustainability. Without strong GSE, employees may comply with green goals superficially; with strong GSE, they go beyond compliance to exhibit proactive and innovative green behaviors.

Recent empirical evidence points to partial mediation, where GSE does not fully explain but significantly enhances the effect of HR practices on EGB. Studies across manufacturing, hospitality, and service sectors consistently show that the direct effects of training, recruitment, and performance systems on EGB are significant, but indirect effects through GSE add explanatory power (Ren et al., 2021; Pham et al., 2020; Luu, 2022)

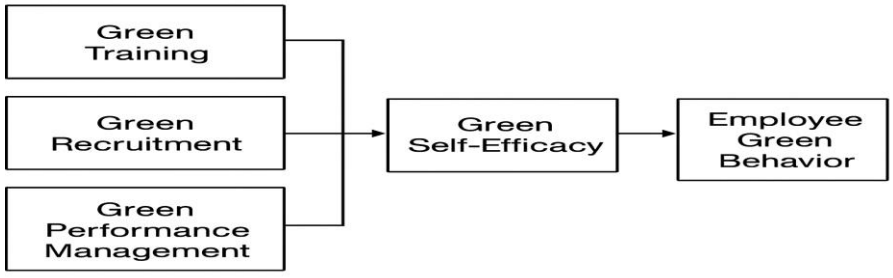

Figure 1: Conceptual Framework

Methodology:

Research Design

This study adopted a cross-sectional quantitative research design to examine the relationships between Green HRM practices namely Green Training, Green Recruitment, and Green Performance Management Green Self-Efficacy (GSE), and Employee Green Behavior (EGB) in the manufacturing industry.

Settings

The research was conducted across three large manufacturing plants and their associated departments, as manufacturing is a resource-intensive sector where employee

behaviors directly impact environmental outcomes such as energy conservation, waste reduction, and pollution control.

Participants

The target population included Managers and supervisors actively involved in daily operational processes. To ensure representativeness, stratified random sampling was employed, with departments and shifts as strata and participants randomly selected within each stratum. A total of 360 usable responses were collected, achieving a response rate of approximately 72%. Inclusion criteria required employees to have at least six months of tenure and direct involvement in operational or managerial tasks, while temporary staff, interns, or employees not participating in departmental processes were excluded.

Data Collection Tools

All constructs were measured using validated Likert-scale instruments ranging from 1 (strongly disagree) to 5 (strongly agree). GT (6 items) assessed knowledge and skill development in environmental practices; GR(5 items) captured hiring strategies aligned with environmental values; GPM (6 items) measured goal-setting, appraisal, and rewards for green behaviors; GSE (5 items) evaluated employees' confidence in performing environmental tasks; and EGB (7 items) reflected observable pro-environmental actions. The instruments were reviewed by two HR academics and two plant HR managers, followed by a pilot study (n = 30) to ensure clarity and appropriateness of items. Ethical considerations included voluntary participation, informed consent, and maintaining confidentiality and anonymity.

Procedure

Data collection was coordinated through departmental managers, who distributed and collected surveys across shifts to ensure comprehensive coverage. Depending on departmental access, both paper based and electronic questionnaires were used, and completion took approximately 15–20 minutes. Supervisors were instructed not to influence responses, maintaining neutrality and confidentiality. Data screening involved handling missing values (<2%) via Expectation-Maximization, identifying 7 multivariate outliers (retained due to substantive plausibility), and verifying univariate normality (skewness |skew| < 2, kurtosis |kurt| < 7).

Analysis Technique

For statistical analysis, Cronbach's alpha and Composite Reliability (CR) were calculated to assess the internal consistency of the scales. Validity was measured through convergent validity (Average Variance Extracted, AVE > 0.50), and discriminant validity (Fornell–Larcker criterion and Heterotrait-Monotrait ratio, HTMT < 0.85). Structural Equation Modeling (SEM) tested the hypothesized direct relationships of Green Training, Recruitment, and Performance Management on Employee Green Behavior (EGB).

Overall, this methodology integrates structural GHRM practices and psychological mechanisms, applying rigorous statistical tests including , SEM, regression, and bootstrapped mediation analysis to provide a clear framework for understanding drivers of employee green behavior in the manufacturing industry.

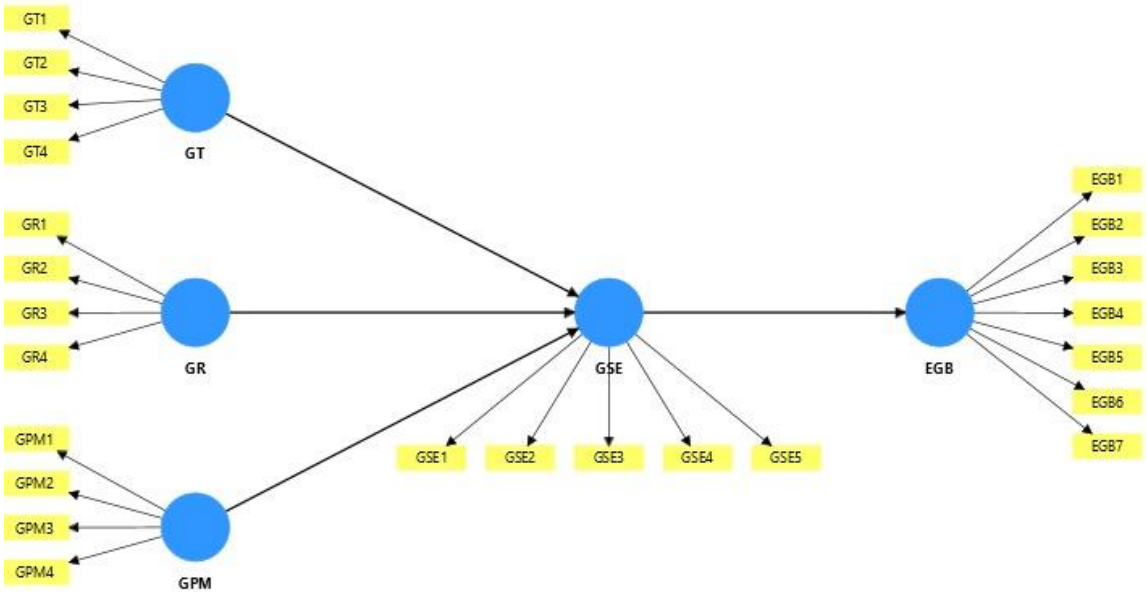

Figure 2: Structural Model

Results

Table 1: Descriptive Statistics of Green HRM Practices

Variable	Mean	SD
GT	3.85	0.65
GR	3.72	0.71
GP	3.9	0.69
EGB	4.01	0.73
GSE	3.95	0.68

Source: Developed by the Autor

Table 1 presents the descriptive statistics for key variables related to GHRM practices. The means of all variables fall between 3.72 and 4.01, indicating that respondents generally reported a moderate to high level of agreement with the presence or effectiveness of these green HRM practices within their organizations.

Table 2: Reliability Analysis of constructs

Construct	Items	Cronbach's Alpha
GT	6	0.87
GR	5	0.83
GPM	6	0.85
EGB	7	0.89
GSE	5	0.84

Source: Developed by the Author

Table 2 presents the reliability analysis of the constructs used in the study, measured using Cronbach's Alpha. This statistic assesses the internal consistency of each construct that is, how closely related the items within each construct are. A Cronbach's Alpha value above 0.70 is generally considered acceptable, while values above 0.80 indicate good reliability.

Table 3: Measurement Model: Reliability and Convergent Validity

Construct	Cronbach's α	Composite Reliability (CR)	Average Variance Extracted (AVE)
GT	0.87	0.91	0.62
GR	0.83	0.88	0.58
GPM	0.85	0.9	0.6
GSE	0.84	0.89	0.61

EGB	0.89	0.92	0.65

Source: Developed by The Author

Table 3 presents the reliability and convergent validity indicators for the constructs used in the measurement model. Three key statistics are reported: Cronbach's Alpha (α), CR, and AVE. These values help assess whether the constructs are measured consistently and whether the items within each construct share enough common variance. All constructs show high internal consistency, with Cronbach's Alpha values ranging from 0.83 to 0.89, all well above the commonly accepted threshold of 0.70. CR values range from 0.88 to 0.92, exceeding the recommended threshold of 0.70, further confirming the reliability of the constructs.

Table 4: Discriminant Validity (Fornell–Larcker Criterion and HTMT)

	GT	**GR**	**GPM**	**EGB**	**GSE**
GT	0.79	0.62	0.59	0.65	0.61
GR	0.62	0.76	0.64	0.68	0.63
GPM	0.59	0.64	0.77	0.70	0.66
EGB	0.65	0.68	0.70	0.81	0.72
GSE	0.61	0.63	0.66	0.72	0.78

Source: Developed by The Author

Table 4 reports the discriminant validity of the constructs using two widely accepted methods: the Fornell–Larcker Criterion (diagonal values) and the Heterotrait–Monotrait Ratio (HTMT) (off-diagonal values). These tests assess whether the constructs are empirically distinct from one another, a crucial requirement in structural equation modeling. All the values are satisfactory

Table 5: Direct Effects of GHRM Practices on EGB

Hypothesis	**Original Sample**	**Sample mean (M)**	**SD**	**t statistics**	**P values**	**Results**
GT→ EGB	0.34	0.33	0.06	5.67	0.000	Supported
GR→ EGB	0.29	0.30	0.07	4.14	0.000	Supported
GPM→EGB	0.42	0.41	0.05	8.40	0.000	Supported
GSE→EGB	0.39	0.38	0.05	7.80	0.000	Supported

Source: Developed by The Author

Table 6: Mediation Analysis Results

Hypothesis	Original Sample (β)	Sample Mean (M)	Standard Deviation (SD)	t Statistics	p value	Results
GT → EGB	0.34	0.33	0.06	5.67	0.000	Supported
GR → EGB	0.29	0.30	0.07	4.14	0.000	Supported
GPM→EGB	0.42	0.41	0.05	8.40	0.000	Supported
GSE→ EGB	0.39	0.38	0.05	7.80	0.000	Supported
GT→GSE → EGB	0.16	0.15	0.04	4.00	0.000	Partial Mediation
GR→GSE →EGB	0.14	0.13	0.04	3.50	0.001	Partial Mediation
GPM→GSE →EGB	0.15	0.14	0.04	3.75	0.000	Partial Mediation

Source: Developed by The Author

Discussion

This study demonstrates that three foundational GHRM levers training, recruitment, and performance management are each associated with higher employee green behavior, and that green self-efficacy partially explains how these practices translate into action. The direct effects indicate that when organizations teach environmental skills (training), select employees whose values align with sustainability (recruitment), and evaluate/reward environmental contributions (performance management), employees report higher engagement in green behaviors at work. These findings accord with prior work emphasizing HR's central role in sustainability (Arulrajah & Opatha, 2016).

Training likely contributes mastery experiences and procedural know-how; recruitment increases value congruence and perceived role legitimacy; performance management adds social persuasion, feedback, and instrumental motivation via goals and rewards all of which raise efficacy beliefs. Partial mediation suggests structural HR practices influence behavior both directly (through goals/incentives and norms) and indirectly (via efficacy building), consistent with multi-pathway models of behavior (Luu, 2022).

Theoretical Implications

First, we integrate three HR practices into one coherent bundle, showing simultaneous effects and a shared mediator. Second, we provide evidence from a manufacturing, emerging-economy context broadening generalizability beyond service-sector or Western samples (Yong et al., 2020). Third, by confirming partial mediation, the study nuances the GHRM → behavior link: efficacy matters, yet structures still exert independent influence.

Managerial Implications

HR leaders should: (1) institutionalize hands-on green training emphasizing mastery and feedback; (2) embed green criteria into job ads, interviews, and selection tools; (3) align performance goals, appraisal forms, and rewards with environmental KPIs; and (4) add efficacy-building micro-interventions peer modeling, quick wins, progress dashboards to raise employees' confidence in executing green tasks.

Limitations and Future research

Cross-sectional design constrains claims of causality; longitudinal or experimental designs could test temporal ordering and persistence. Self-report measures may inflate associations; multi-source data (supervisor ratings, objective environmental metrics) would enhance robustness. Future research could examine moderators (e.g., green transformational leadership, operational constraints), additional mediators (green identity, perceived organizational support), and cost benefit analyses of HR interventions at different adoption stages.

Novelty Revisited

The research offers a granular, practical description of three HR levers together with GSE in one structural model inside emerging economy's manufacturing. how psychological states and HR systems work together to generate EGB.

Conclusion

This study demonstrates that Green Training, Green Recruitment, and Green Performance Management each serve as significant predictors of Employee Green Behavior (EGB), with Green Self-Efficacy (GSE) acting as a partial mediator in these relationships. The findings provide strong support for social cognitive explanations of

workplace sustainability, showing that while structural HR practices provide the foundation for pro-environmental action, their impact is magnified when paired with psychological mechanisms such as efficacy-building. Employees who believe in their own ability to act sustainably are more likely to translate training, recruitment alignment, and performance management systems into concrete behavioral outcomes.

The evidence offers both theoretical contributions and practical implications. Theoretically, this research integrates three distinct GHRM practices into a comprehensive and coherent model that connects multiple HR levers to green behavior through a psychological pathway. Previous research often examined isolated practices, but this study demonstrates the additive and complementary effects of bundled HR interventions. Additionally, by empirically validating the role of GSE as a mediator, it extends prior theorizing on the psychological underpinnings of EGB. Contextually, the study contributes evidence from the manufacturing sector of an emerging economy, a setting often under-represented in sustainability scholarship despite its environmental salience.

Practically, the results highlight high-leverage actions for managers in manufacturing firms. Integrating green competencies into training programs ensures employees are equipped with relevant knowledge and skills. Recruiting candidates whose values align with environmental sustainability increases the likelihood of sustained pro-environmental commitment. Aligning performance management systems with environmental Key Performance Indicators (KPIs) reinforces accountability and encourages consistent green action. Importantly, these structural levers should be complemented with micro-interventions aimed at building GSE, such as experiential training, mentoring, recognition for small green wins, and opportunities for mastery. When employees feel confident in their ability to contribute, the effects of organizational systems are amplified, leading to stronger and more consistent green behaviors.

At the same time, the study acknowledges certain limitations. Its cross-sectional design restricts causal inference, while the reliance on self-reported survey data raises the potential for bias. The focus on a single sector within one emerging economy also limits generalizability. Nevertheless, the methodological rigor including the use of validated scales, structural equation modeling, and bootstrapping strengthens the reliability of findings. Future research should address these limitations by employing longitudinal and

experimental designs to validate causal relationships, extending the framework to other high-impact sectors such as construction, energy, and transportation, and examining additional mediators or moderators such as organizational culture and leadership. Such extensions would broaden the applicability of the model and deepen understanding of the interplay between HR systems and psychological mechanisms in driving sustainability.

In conclusion, this study underscores that pairing structural HR practices with efficacy-building mechanisms yields stronger behavioral outcomes than relying on either approach alone. For manufacturing firms, where environmental impacts are material and highly visible, embedding green competencies into training, aligning staffing with environmental values, and linking performance systems to environmental KPIs while simultaneously fostering employees' confidence to act represent the most effective pathway to sustainability. By doing so, organizations not only enhance their own environmental performance but also contribute meaningfully to global efforts to combat climate change.

References

Abdullah, M., Zailani, S., Iranmanesh, M., & Jayaraman, K. (2020). Barriers to green innovation initiatives among manufacturers. Journal of Cleaner Production, 247, 119–129.

Arulrajah, A. A., & Opatha, H. H. D. N. P. (2016). Green human resource management practices: A review. Sri Lankan Journal of Human Resource Management, 5(1), 1–16.

Dumont, J., Shen, J., & Deng, X. (2017). Effects of green HRM on employee workplace green behavior. Human Resource Management, 56(4), 613–627.

International Energy Agency. (2022). Energy efficiency and industrial emissions: Global status report. Paris: IEA.

Luu, T. (2022). Green HRM and employee pro-environmental behavior: Mediating role of green self-efficacy. Journal of Cleaner Production, 332, 129999.

Luu, T. T. (2022). Green self-efficacy and employee green behavior: The roles of green shared vision and organizational citizenship behavior for the environment. Journal of Sustainable Tourism, 30(4), 893–912. https://doi.org/10.1080/09669582.2021.1887878

Ren, S., Tang, G., & Jackson, S. E. (2021). Green human resource management research: A review and future directions. Asia Pacific Journal of Management, 38(1), 1–35. https://doi.org/10.1007/s10490-020-09725-9.

Ones, D. S., & Dilchert, S. (2019). Measuring, understanding, and influencing employee green behaviors. In S. E. Jackson, D. Ones, & S. Dilchert (Eds.), Managing human resources for environmental sustainability (pp. 115–142). Routledge

Pinzone, M., et al. (2019). The role of Green HRM in progressing sustainability. Journal of Cleaner Production, 218, 576–587.

Pham, N. T., Tučková, Z., & Jabbour, C. J. C. (2019). Greening the hospitality industry: How do green human resource management practices influence organizational citizenship behavior for the environment? Tourism Management, 72, 386–399. https://doi.org/10.1016/j.tourman.2018.12.008

Pham, N. T., Tučková, Z., & Jabbour, C. J. C. (2020). Greening the hospitality industry: How do green human resource management practices influence organizational citizenship behavior for the environment? Tourism Management, 72, 386–399. https://doi.org/10.1016/j.tourman.2018.12.008

Renwick, D. W. S., Redman, T., & Maguire, S. (2019). Green human resource management: A review and research agenda. International Journal of Management Reviews, 15(1), 1–14. https://doi.org/10.1111/j.1468-2370.2011.00328.x.

Ren, S., Tang, G., & Jackson, S. E. (2021). Green human resource management research: A review and future directions. Asia Pacific Journal of Management, 38(1), 1–35. https://doi.org/10.1007/s10490-020-09725-9

Tang, G., Chen, Y., & Jiang, Y. (2021). Green human resource management practices: Scale development, validity, and cross-context evidence. Asia Pacific Journal of Human Resources, 59(1), 5–31. https://doi.org/10.1111/1744-7941.12245

Yong, J. Y., Yusliza, M. Y., Ramayah, T., Chiappetta Jabbour, C. J., Sehnem, S., & Mani, V. (2020). Pathways towards sustainability in manufacturing organizations: Empirical evidence on the role of green human resource management. Business Strategy and the Environment, 29(1), 212–228

Yong, J. Y., Yusliza, M. Y., Ramayah, T., & Fawehinmi, O. (2020). Nexus between green intellectual capital and Green HRM. Sustainability, 12(1), 1–18.