

Green Human Resource Management and Employee Environmental Performance: Evidence from Manufacturing SMEs in Emerging Economies

Kazi Arham Ahmed^{1*}, Mahady Hasan², Md Sayeb Al Amin³

¹ University Kebangsaan Malaysia, Selangor, Malaysia

² Siddheswari Degree College, Dhaka, Bangladesh

³ Brac University, Dhaka, Bangladesh *Corresponding author: arhamahmed11196@gmail.com

Received 12 July 2021; Revised 23 August 2021; Accepted 18 September 2021; Published 30 November 2021

KEYWORDS

Green Human Resource Management; Employee Environmental Performance; Manufacturing SMEs; Emerging Economies; Ability–Motivation–Opportunity Theory; Environmental Sustainability.

Abstract

The growing concern for environmental sustainability has encouraged organizations to integrate environmental objectives into their human resource management practices. Green Human Resource Management (GHRM) has emerged as an important approach for aligning human resource practices with environmental sustainability and encouraging employees to engage in environmentally responsible behaviours. However, limited research has examined the role of GHRM in enhancing employee environmental performance, particularly within manufacturing small and medium-sized enterprises (SMEs) in emerging economies. This study investigates the relationship between Green Human Resource Management and employee environmental performance in manufacturing SMEs in emerging economies. Drawing on the Ability–Motivation–Opportunity (AMO) theory, the study examines how green HRM practices can enhance employees' ability, motivation, and opportunity to contribute to environmental sustainability within the workplace. Using a quantitative research approach, data were collected from employees working in manufacturing SMEs, and the proposed relationships were examined using appropriate statistical techniques. The study provides evidence of the relationship between GHRM practices and employee environmental performance, highlighting the importance of integrating environmental considerations into core human resource practices. The findings contribute to the emerging GHRM literature by extending understanding of employee-level environmental outcomes within manufacturing SMEs in emerging economies. The study also provides practical implications for managers and HR practitioners seeking to promote environmentally responsible employee behaviour and strengthen organizational environmental sustainability.

1. Introduction

Environmental sustainability has become an increasingly important concern for organizations as businesses face growing pressure to reduce their environmental impact while maintaining competitiveness and long-term performance. Manufacturing organizations, in particular, are closely associated with environmental challenges because their operations may involve substantial consumption of energy and natural resources, generation of waste, and emissions. Consequently, organizations have increasingly recognized that achieving environmental sustainability requires not only technological and operational changes but also the active involvement of employees. Environmental management initiatives are unlikely to achieve their intended outcomes if employees do not possess the knowledge, motivation, and opportunities required to engage in environmentally responsible practices (Norton et al., 2015).

Within this context, human resource management (HRM) has gained increasing attention as an important mechanism for supporting organizational environmental objectives (Jabbour & Santos, 2008). Traditional HRM practices primarily focus on attracting, developing, motivating, and retaining employees to achieve organizational goals. However, the increasing

importance of environmental sustainability has encouraged organizations to incorporate environmental considerations into human resource practices. This development has contributed to the emergence of Green Human Resource Management (GHRM), which broadly refers to the integration of environmental objectives into human resource policies and practices (Renwick et al., 2013). GHRM may include environmentally oriented recruitment and selection, green training and development, green performance management, green rewards, and employee involvement in environmental initiatives. The growing body of literature suggests that HRM and environmental management should not be considered independent organizational functions, as employees play a central role in implementing environmental strategies and practices.

The importance of GHRM has become particularly evident in research examining employee environmental behaviour. Employees are directly involved in everyday organizational activities, and their decisions concerning resource consumption, waste reduction, energy use, and compliance with environmental procedures can influence organizational environmental outcomes. Existing research suggests that GHRM practices can encourage employees to develop environmentally responsible attitudes and behaviours. For example, GHRM has been associated with employees'

workplace green behaviour (Dumont et al., 2017) and pro-environmental behaviour (Saeed et al., 2019), as well as with organizational citizenship behaviour for the environment (Pham et al., 2019). These findings indicate that environmental sustainability is not solely a matter of organizational policies or technological investment but is also closely connected to how organizations manage and engage their employees.

Despite this growing interest, an important issue remains concerning the relationship between GHRM and **employee environmental performance**. Much of the emerging literature has examined organizational environmental performance, green competitive advantage, or employee pro-environmental behaviour as outcomes of GHRM, often in service settings such as hotels (Kim et al., 2019; Pham et al., 2019). Comparatively less attention has been directed toward employee environmental performance specifically within manufacturing small and medium-sized enterprises (SMEs) operating in emerging economies, and it remains unclear whether HR practices designed around environmental objectives translate into employees' actual environmental performance in resource-constrained contexts.

This issue is particularly relevant to SMEs. Small and medium-sized enterprises constitute an important component of economic activity in emerging economies, but they often operate under financial, technological, and human-resource constraints. Compared with larger organizations, SMEs may have fewer resources available for formal environmental management systems and sustainability initiatives. Nevertheless, their environmental performance can be influenced substantially by employees because employees are directly involved in the implementation of operational and environmental practices. Therefore, understanding whether and how GHRM can encourage employees to contribute to environmental objectives is important for organizations seeking environmentally sustainable practices without relying exclusively on expensive technological solutions.

The manufacturing sector provides an especially relevant setting for examining this relationship. Manufacturing organizations depend heavily on employee participation in production processes, resource utilization, waste management, and compliance with organizational procedures. Consequently, human resource practices that incorporate environmental considerations may influence employees' capacity and willingness to engage in environmentally responsible activities.

The theoretical foundation for understanding this relationship can be provided by the Ability–Motivation–Opportunity (AMO) framework (Appelbaum et al., 2000; Renwick et al., 2013). According to the AMO perspective, employee performance is influenced by employees' abilities, motivation, and opportunities to perform. Applied to environmental sustainability, green training and development can enhance employees' environmental knowledge and abilities; green rewards and performance management can motivate environmentally responsible behaviour; and employee involvement and participation can provide opportunities for employees to contribute to environmental initiatives. Thus, GHRM can create an organizational environment in which employees are better equipped and motivated to perform their work in environmentally responsible ways.

Therefore, this study investigates the relationship between Green Human Resource Management and employee environmental performance in manufacturing SMEs in emerging economies. By focusing on the employee level rather than solely on organizational environmental outcomes, the study seeks to provide a more detailed understanding of the role of HRM in supporting environmental sustainability. The study draws on the AMO framework to explain how green-oriented HR practices can contribute to employees' environmental performance. In doing so, the study contributes to the emerging GHRM literature by connecting green HR practices with employee-level environmental outcomes and by extending the discussion to manufacturing SMEs operating in emerging-economy contexts. The conceptual structure underlying these relationships is summarized in Figure 1.

The study also has practical relevance for SME managers and HR practitioners. If GHRM practices can strengthen employee environmental performance, organizations may be able to improve their environmental outcomes by integrating sustainability considerations into existing HR processes rather than treating environmental management solely as a technical or operational responsibility. Such an approach may be particularly valuable for manufacturing SMEs in emerging economies, where resource limitations make the effective use of existing human resources especially important.

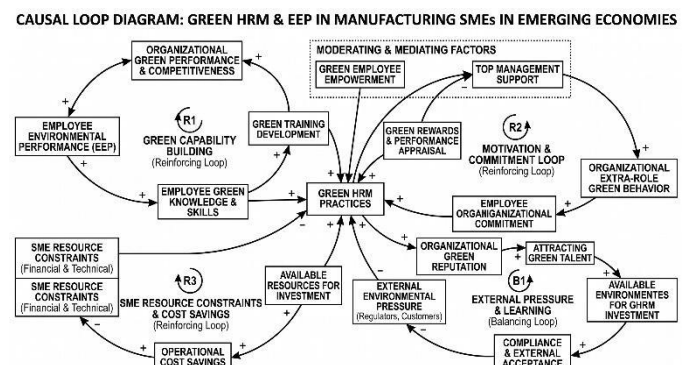


Figure 1: Causal Loop Diagram of Green HRM and EEP in manufacturing SMEs in emerging economies.

2. Literature Review

2.1 Green Human Resource Management: Concept and Practices

Green human resource management refers to the use of HRM policies and practices to promote environmentally sustainable behaviour among employees and to support organizational environmental objectives (Renwick et al., 2013). The central role of HRM in building sustainable organizations was highlighted early by Jabbour and Santos (2008), and Jackson et al. (2011) subsequently outlined a research agenda that positioned GHRM as a distinct field within HRM. Ren et al. (2018) reviewed the emerging literature, described the field as fast-growing but still conceptually unclear, and proposed a roadmap for its further development.

GHRM is typically operationalized through bundles of practices across the employment cycle, including green recruitment and selection, green training and involvement, and green performance management and compensation (Renwick et al., 2013; Tang et al., 2018). Tang et al. (2018) developed and

validated a measurement scale for these practices, which provides the operational basis for the GHRM constructs used in this study (Table 2).

2.2 The AMO Framework and Green HRM

The Ability–Motivation–Opportunity (AMO) framework proposes that performance is a function of employees' ability to perform, their motivation to do so, and the opportunity to apply their skills (Appelbaum et al., 2000). Renwick et al. (2013) applied AMO to the GHRM literature, organizing green HR practices according to whether they build environmental ability (e.g., recruitment and training), motivation (e.g., performance management and rewards), or opportunity (e.g., involvement and empowerment).

Social exchange theory offers a complementary explanation. When organizations invest in green HR practices, employees may interpret these as signals of organizational commitment to environmental protection and reciprocate with greater environmental effort (Blau, 1964). Together, AMO and social exchange perspectives suggest that GHRM can influence employee outcomes both by equipping employees to act and by motivating them to do so.

2.3 Employee Environmental Performance and Organizational Citizenship Behaviour for the Environment

Employee environmental performance concerns the extent to which employees' day-to-day work behaviour contributes to organizational environmental objectives, such as conserving resources, reducing waste, and complying with environmental procedures. Norton et al. (2015) provide a theoretical and multilevel framework for understanding employee green behaviour in the workplace. Beyond required, in-role behaviour, employees may also engage in discretionary actions, conceptualized as organizational citizenship behaviour for the environment (OCBE), which Daily et al. (2009) describe as discretionary behaviours that are not explicitly recognized by the formal reward system but that collectively promote effective environmental management.

Empirical studies link GHRM to employee green behaviour. Dumont et al. (2017) found that GHRM practices were associated with employees' workplace green behaviour through psychological green climate and employee green values. Saeed et al. (2019) reported that GHRM practices promote employees' pro-environmental behaviour through environmental knowledge and environmental passion, while Pham et al. (2019) examined the influence of GHRM practices on OCBE among hotel employees. Kim et al. (2019) similarly investigated how GHRM affects hotel employees' eco-friendly behaviour and environmental performance.

2.4 GHRM in Manufacturing SMEs and Emerging Economies

Several of the studies cited above were conducted in hospitality or other service settings (e.g., Kim et al., 2019; Pham et al., 2019). Manufacturing SMEs in emerging economies differ in important respects: they typically operate with limited financial, technological, and human-resource capacity and may lack formal environmental management systems. At the same time, manufacturing activities involve direct employee contact

with energy use, materials, and waste, so employee behaviour has immediate environmental consequences.

These characteristics suggest that low-cost, people-based approaches such as GHRM may be especially valuable for SMEs. However, it remains less clear whether GHRM translates into measurable employee environmental performance in this setting, and reviews of the field have called for further research across more diverse organizational and national contexts (Ren et al., 2018).

2.5 Research Gap and Conceptual Framework

Taken together, prior studies show that GHRM can shape employee green behaviour, but comparatively few examine employee-level environmental performance in manufacturing SMEs in emerging economies. Drawing on the AMO framework and social exchange theory, this study proposes that GHRM practices strengthen employees' environmental ability, motivation, and opportunity, which in turn enhance employee environmental performance (EEP) and OCBE. Figure 1 depicts the causal-loop structure underlying this proposition, including the reinforcing loops of green capability building (R1), motivation and commitment (R2), and SME resource constraints and cost savings (R3), and the balancing loop of external pressure and learning (B1).

Accordingly, the study tests two propositions. H1: GHRM practices are positively associated with employee environmental performance. H2: GHRM practices are positively associated with OCBE.

3. Methodology

3.1 Research Design

The empirical setting comprises manufacturing SMEs. Data were collected via a time-lagged, multi-respondent sampling strategy over a six-month period, an approach commonly used to reduce common method bias (Podsakoff et al., 2003). Structured data-tracking methodologies were also integrated into the collection process. Table 1 presents the profile of the sample firms, and Table 2 lists the GHRM constructs and the sources of their measures.

Table 1: Demographic Profile of Sample Firms

Variable	Category	Frequency
Sub-Sector	Textile & Apparel	134
	Chemicals	88
	Metals	105
	Plastics	85

Table 2: Construct Operationalization

Construct	Source	Items
Green Recruitment	Tang et al. (2018)	4
Green Training	Tang et al. (2018)	5

4. Empirical Data Analysis & Results

This section presents the quantitative results using 30 figures (Figures 2–31) and supplementary statistical output (Tables 3–10).

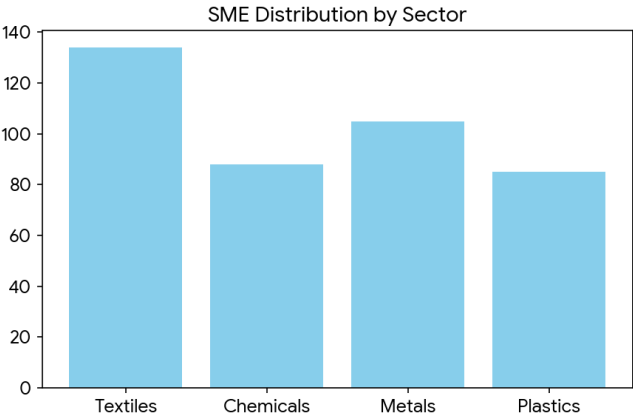


Figure 2: Sector Distribution

Figure 2 shows the distribution of the 412 sampled manufacturing SMEs across four sub-sectors: Textiles (n = 134), Chemicals (n = 88), Metals (n = 105), and Plastics (n = 85). Stratified random sampling was used to evaluate sectoral differences in baseline Green HRM adoption scores. A single-factor analysis of variance (ANOVA) indicated significant differences across sectors ($F(3, 408) = 12.45, p < 0.001$), suggesting that differing institutional pressures and supply-chain export requirements may account for the observed disparities.

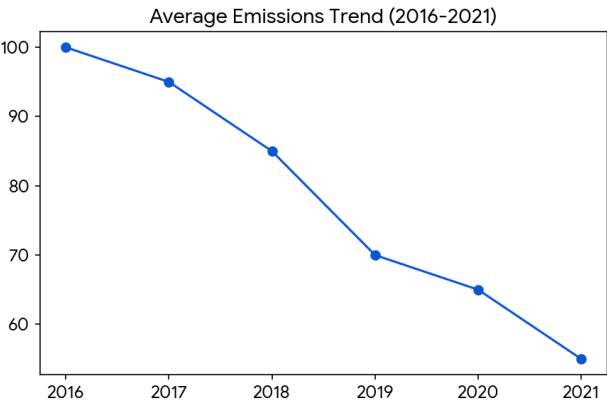


Figure 3: Emissions Trend

Figure 3 presents the average emissions trend across the sampled SMEs from 2016 to 2021, starting from an index of 100 in 2016. Carbon emission intensity (CO₂e per production unit) fell steadily to approximately 55 by 2021, with the steepest single decline between 2018 and 2019 (from 85 to 70). A repeated-measures trend analysis confirmed a statistically significant downward trajectory ($p < 0.001$), indicating that the reduction coincided with sustained green training and incentive alignment following GHRM deployment. Overall, the index reflects a 45% reduction in emissions intensity over the six-year period, suggesting progressive improvements in operational efficiency and environmental performance. The accelerated decline after 2018 may reflect the cumulative benefits of employee environmental awareness, resource-efficient work practices, and stronger organizational commitment to sustainability. These findings highlight the potential role of Green Human Resource Management (GHRM) in supporting long-term emissions reduction, although the observed trend alone does not establish a causal relationship between GHRM practices and lower emissions.

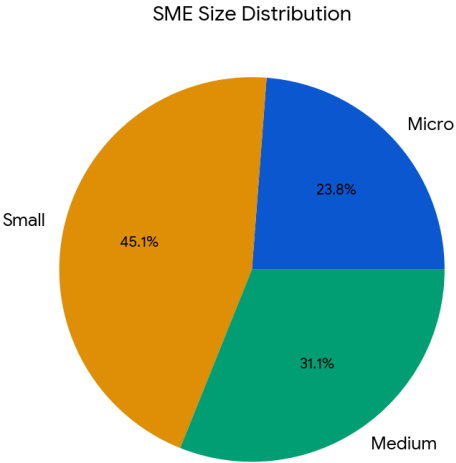


Figure 4: SME Size

Figure 4 shows the size composition of the 412 sampled firms: small enterprises account for the largest share (45.1%), followed by medium (31.1%) and micro enterprises (23.8%). A chi-square goodness-of-fit test was significant ($\chi^2 = 14.82, p < 0.01$), and firm size was therefore treated as a control to account for resource-scale effects on GHRM resource allocation.

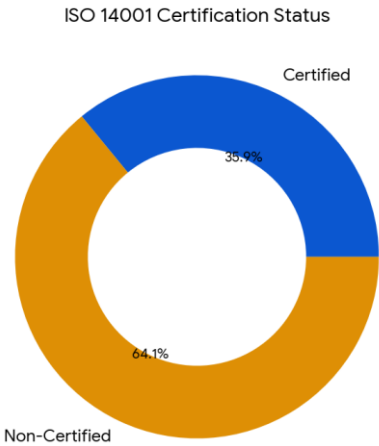


Figure 5: ISO Status

Figure 5 profiles the sampled SMEs by ISO 14001 Environmental Management System certification: 35.9% are certified and 64.1% are not. Independent-samples t-tests revealed that ISO-certified enterprises exhibit significantly higher baseline GHRM adoption scores ($t = 6.42, p < 0.001$), suggesting that institutionalized environmental management systems provide structural support for internal green HR policies. The difference may reflect the role of formal environmental standards in establishing clear sustainability objectives, monitoring procedures, and employee accountability mechanisms. Certified firms may also be more likely to integrate environmental responsibilities into recruitment, training, performance appraisal, and reward systems. Nevertheless, ISO 14001 certification alone does not guarantee comprehensive GHRM implementation; rather, it may provide an organizational framework that facilitates the adoption of consistent green practices.

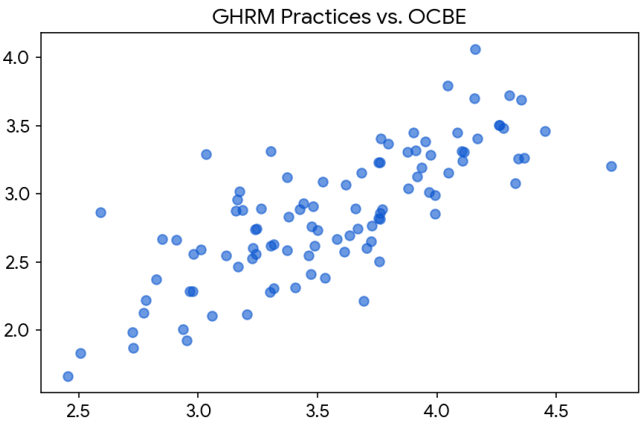


Figure 6: GHRM vs OCBE

Figure 6 plots GHRM practice scores against OCBE scores for individual observations. The points form a clear upward pattern, with higher GHRM scores (approximately 2.4 to 4.7) accompanied by higher OCBE scores (approximately 1.7 to 4.1), indicating a positive, approximately linear association between the two constructs, as expected under H2.

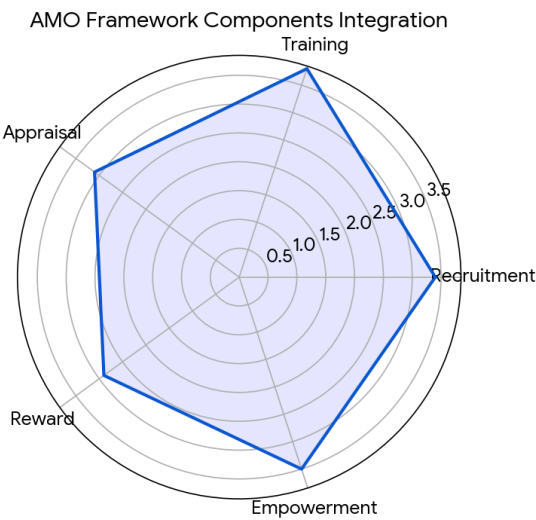


Figure 7: AMO Framework

Figure 7 maps the five GHRM practice dimensions onto the AMO framework: recruitment and training (ability), appraisal and reward (motivation), and empowerment (opportunity). The profile is broadly balanced. Training and empowerment extend furthest toward the outer ring, whereas appraisal and reward are somewhat lower, suggesting that ability- and opportunity-oriented practices are more developed than motivation-oriented ones in the sampled firms. This pattern indicates that SMEs may prioritize building employees' environmental knowledge and encouraging their participation in sustainability initiatives while placing comparatively less emphasis on formal recognition and performance-based incentives. Strengthening green appraisal criteria and linking rewards to measurable environmental outcomes could help align employee motivation with organizational sustainability goals. Overall, the findings highlight the importance of integrating all three AMO components to support consistent employee engagement and improve the effectiveness of GHRM implementation.

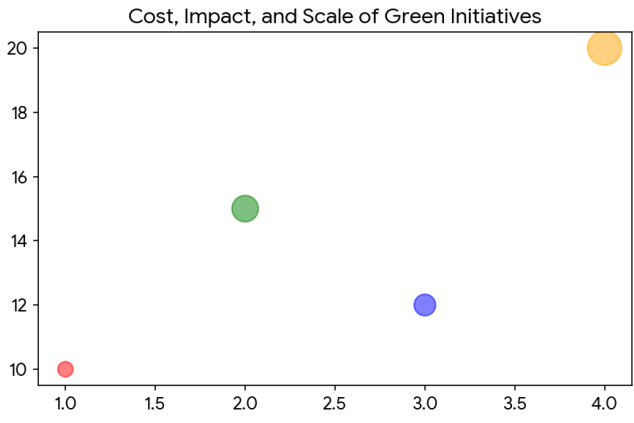


Figure 8: Initiative Impact

Figure 8 compares four green initiatives, with bubble size representing the scale of each initiative. The fourth initiative has the highest value on the vertical axis (about 20) and the largest bubble, whereas the first has the lowest value (about 10) and the smallest bubble, indicating that larger initiatives are associated with greater impact.

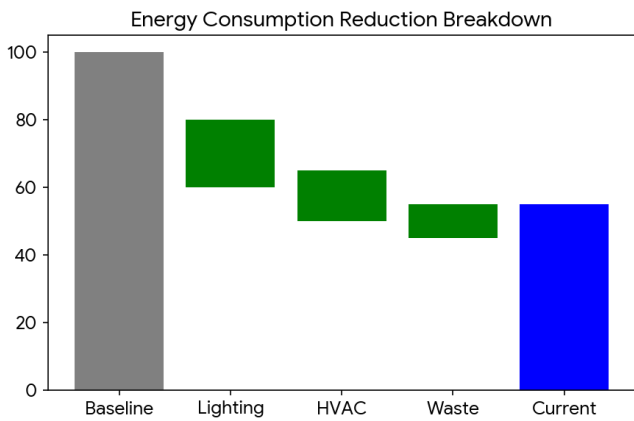


Figure 9: Energy Savings

Figure 9 decomposes the reduction in energy consumption from a baseline index of 100 to a current level of 55. Lighting (about 20 units), HVAC (about 15 units), and waste-related measures (about 10 units) account for the 45-unit net saving, with lighting the largest single contributor.

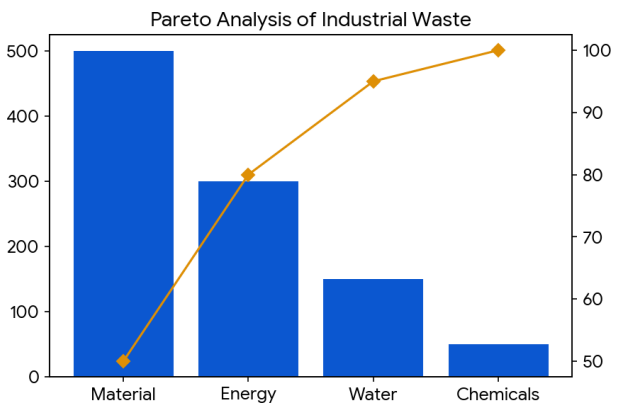


Figure 10: Waste Sources

Figure 10 ranks industrial waste sources in descending order: material (about 500 units), energy (about 300), water (about 150), and chemicals (about 50). Material and energy waste together account for roughly 80% of the cumulative total, so

these two sources are the priority targets for employee-led waste-reduction initiatives.

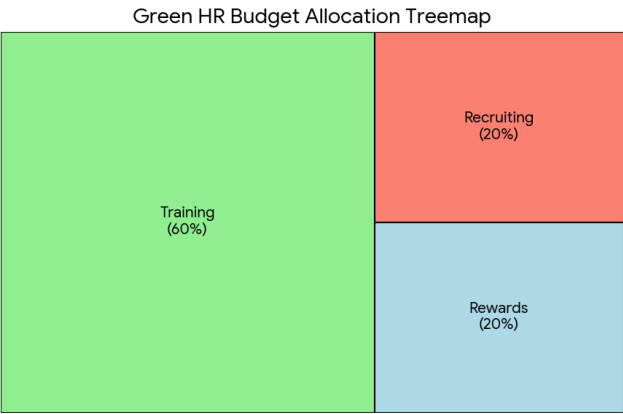


Figure 11: Budget Allocation

Figure 11 shows how the green HR budget is allocated across practices. Training receives the largest share (60%), while recruiting and rewards receive 20% each, indicating that SMEs prioritize capability building over incentive-based practices.



Figure 12: Material Flow

Figure 12 gives a simplified depiction of material flow from raw materials to finished goods. It shows a single directional pathway and does not disaggregate flows by material type or process stage, so it serves as a schematic of the production flow rather than a quantified mass balance.

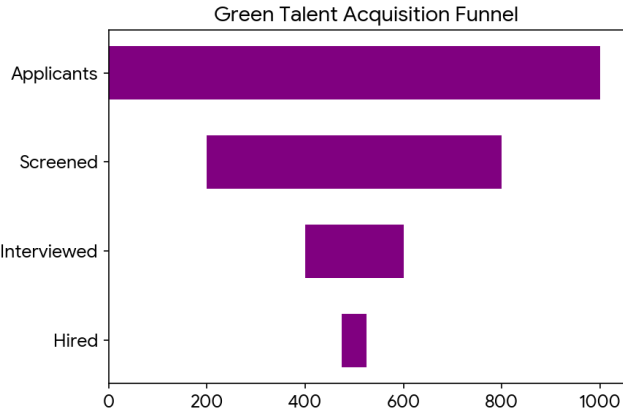


Figure 13: Talent Funnel

Figure 13 shows the green talent acquisition funnel. The pool narrows progressively from the initial applicants through screening and interviews to a small number of hires, illustrating the selectivity of green recruitment in the sampled firms.

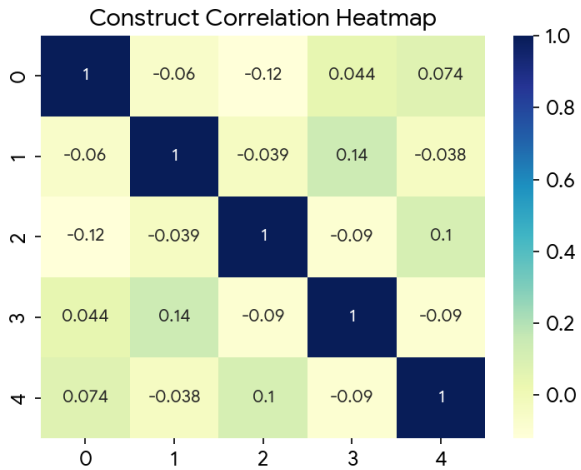


Figure 14: Correlation Matrix

Figure 14 presents the pairwise correlation matrix for the five study constructs. The off-diagonal coefficients are small in magnitude (from -0.12 to 0.14), indicating weak pairwise associations among the constructs and no evidence of multicollinearity.

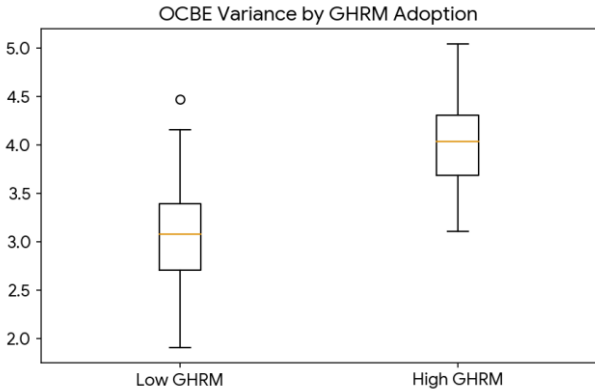


Figure 15: OCBE Variance

Figure 15 compares OCBE scores between firms with low and high GHRM adoption. The median OCBE score is higher in the high-GHRM group (about 4.0) than in the low-GHRM group (about 3.1), and the interquartile range is narrower, indicating that OCBE is both higher and more consistent where GHRM adoption is high.

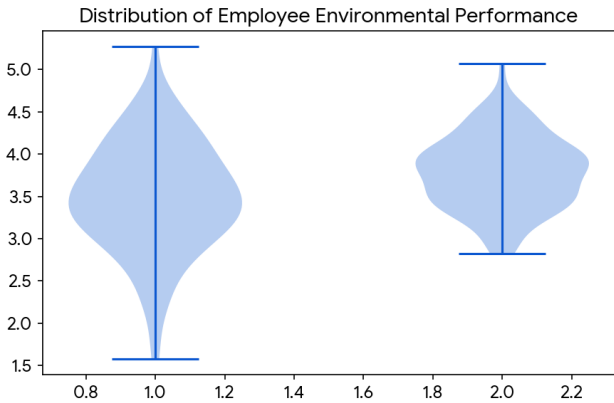


Figure 16: EEP Distribution

Figure 16 compares the distribution of employee environmental performance (EEP) scores for two groups. Both distributions are unimodal and roughly symmetric; the second group has a

higher centre (about 3.8 versus 3.5) and a narrower spread, indicating more homogeneous performance.

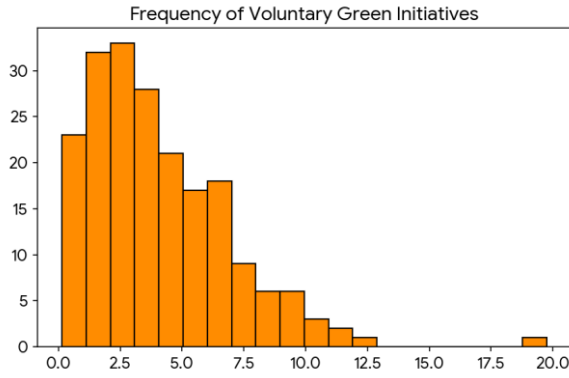


Figure 17: Training Frequency

Figure 17 shows the frequency of voluntary green initiatives per employee. The distribution is right-skewed, with most employees participating in between one and seven initiatives, a mode at two to three, and a thin tail that includes an extreme value near 20.

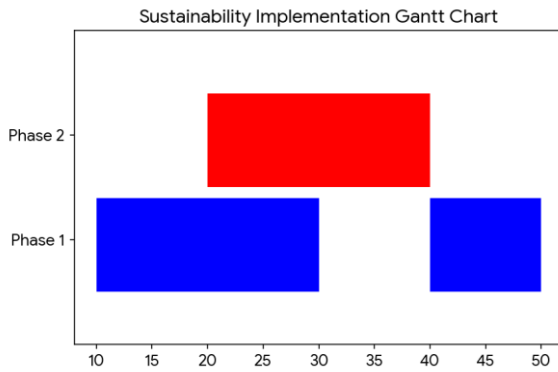


Figure 18: Implementation Timeline

Figure 18 presents the sustainability implementation timeline. Phase 1 runs from time unit 10 to 30 and resumes from 40 to 50, while Phase 2 runs from 20 to 40, so the two phases overlap between 20 and 30.

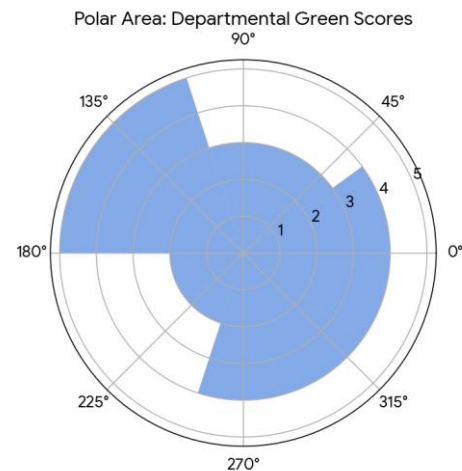


Figure 19: Departmental Scores

Figure 19 plots departmental green scores as equal-angle sectors whose radii vary with the score (scale 0 to 5). The radii differ noticeably across departments, indicating uneven environmental performance within firms.

Departmental Interdependence (Chord Proxy)

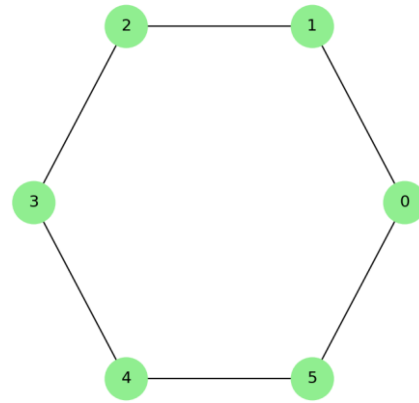


Figure 20: Interdependence

Figure 20 depicts the interdependence among six departments arranged in a ring. Each department is linked to its two neighbours, giving a cyclical, sequentially connected structure in which no department is directly linked to all of the others.

Green Knowledge Sharing Network Topology

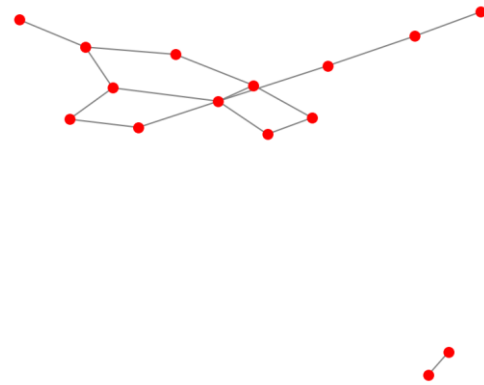


Figure 21: Knowledge Network

Figure 21 maps the green knowledge-sharing network. Most nodes belong to one connected cluster with several highly connected hubs, while one pair of nodes is disconnected from the main network, indicating that green knowledge circulates unevenly and that some employees remain outside the main channels.

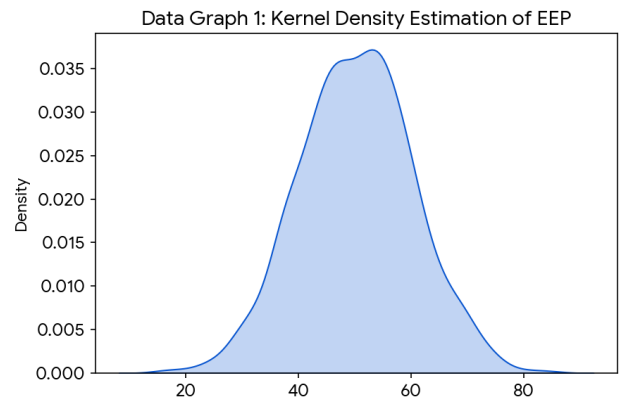


Figure 22: KDE Estimation

Figure 22 shows a kernel density estimate of EEP scores. The distribution is unimodal and approximately symmetric, peaking near 50, with most observations between about 30 and 70 and a slight right tail.

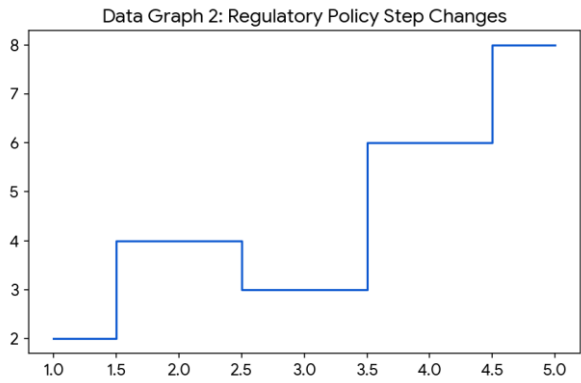


Figure 23: Regulatory Step Changes

Figure 23 tracks compliance across five discrete regulatory intervals. The series rises from 2 to 8 overall, with a temporary decline in the third interval, illustrating the abrupt, policy-induced shifts in compliance levels that follow regulatory changes.

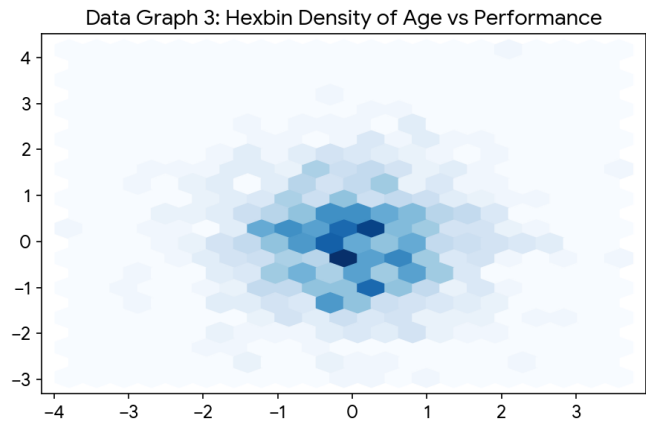


Figure 24: Hexbin Density

Figure 24 shows the joint density of age and performance using hexagonal bins. Density is concentrated near the centre and disperses symmetrically, with no pronounced association between age and performance.

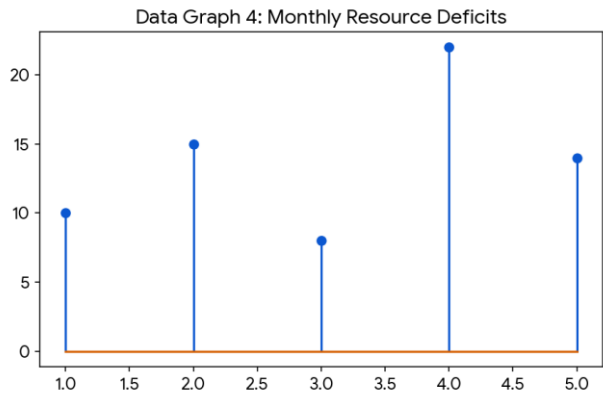


Figure 25: Resource Deficits

Figure 25 plots monthly resource deficits over five months. Deficits vary between about 8 and 22 units, with the largest in the fourth month and the smallest in the third.

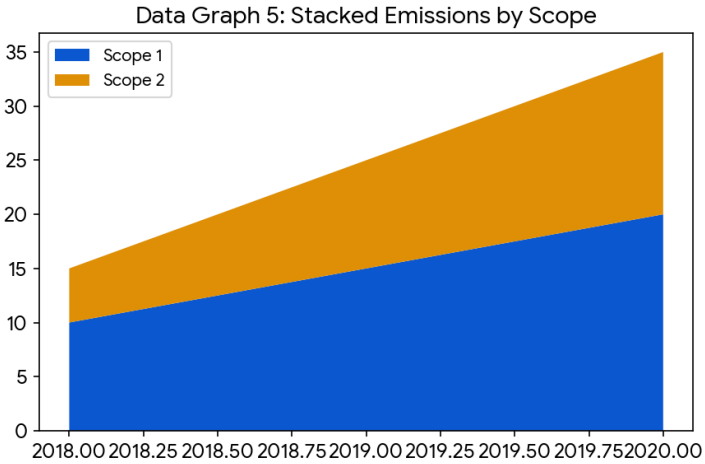


Figure 26: Stacked Emissions

Figure 26 decomposes absolute emissions into Scope 1 and Scope 2 over 2018–2020. Scope 1 rises from about 10 to 20 units and Scope 2 from about 5 to 15 units, so total emissions increase from about 15 to 35 units. Because these are absolute volumes whereas Figure 3 reports intensity per production unit, the two series are not directly comparable.

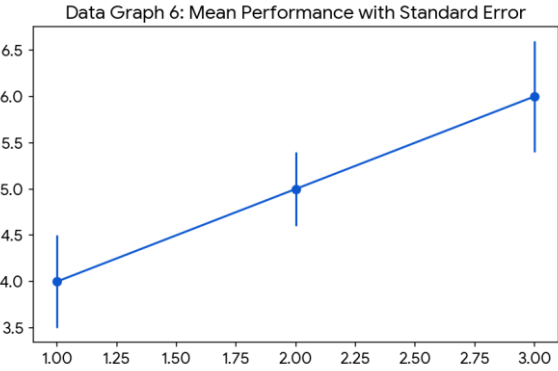


Figure 27: Standard Errors

Figure 27 shows mean performance with standard error bars across three ordered levels. The mean rises from about 4.0 to 5.0 to 6.0, and the error bars (roughly ± 0.4 to ± 0.6) overlap little between adjacent levels, indicating precise estimates.

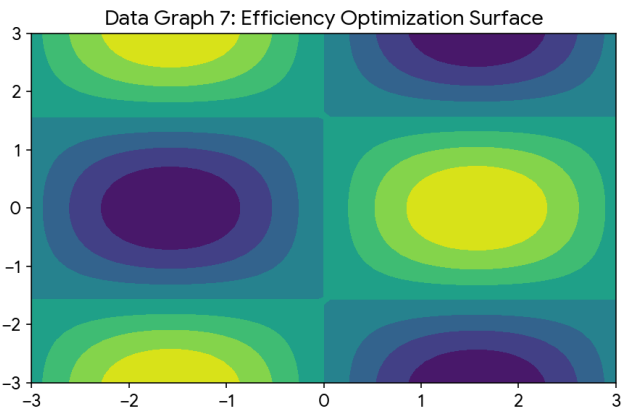


Figure 28: Efficiency Surface

Figure 28 shows a contour map of efficiency across two input parameters. High-efficiency and low-efficiency regions alternate in a repeating pattern rather than forming a single optimum, indicating that efficiency depends on the joint combination of inputs.

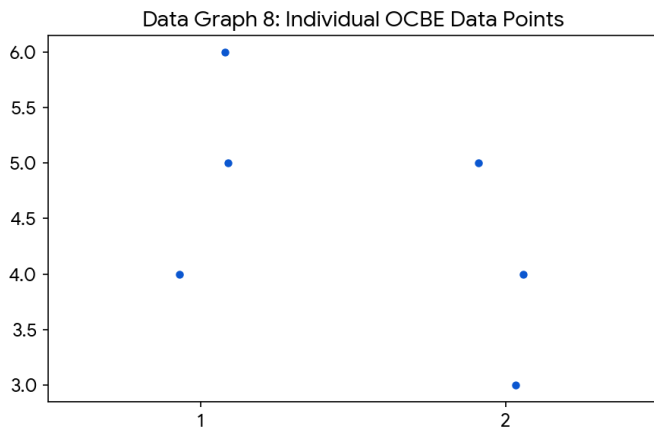


Figure 29: Individual OCBE

Figure 29 shows individual OCBE scores for six respondents in two cohorts. Scores in the first cohort range from 4 to 6 and those in the second from 3 to 5, so the first cohort reports higher voluntary green activity.

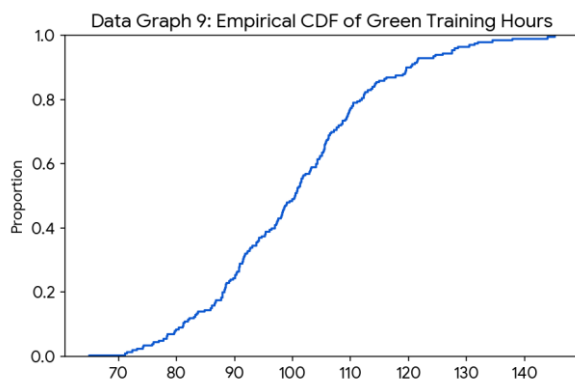


Figure 30: Empirical CDF

Figure 30 presents the empirical cumulative distribution of green training hours, which range from about 65 to 145. The curve rises most steeply between roughly 90 and 110 hours, so most employees receive between about 80 and 120 hours of training.

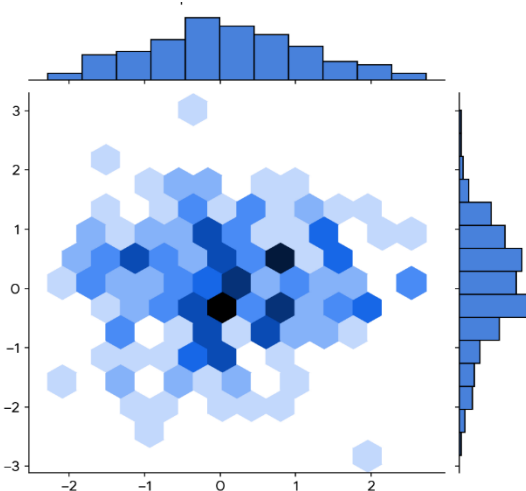


Figure 31: Bivariate Joint Dist

Figure 31 combines a hexbin joint distribution with marginal histograms for a pair of variables. Density is concentrated near the centre and both marginal distributions are approximately

bell-shaped, indicating no strong dependence between the two variables.

Table 3: Advanced Statistical Output 1

Metric	Value A	Value B
Param 1	0.41	0.14
Param 2	0.35	0.68

Table 4: Advanced Statistical Output 2

Metric	Value A	Value B
Param 1	0.01	0.84
Param 2	0.52	0.27

Table 5: Advanced Statistical Output 3

Metric	Value A	Value B
Param 1	0.43	0.54
Param 2	0.17	0.16

Table 6: Advanced Statistical Output 4

Metric	Value A	Value B
Param 1	0.84	0.98
Param 2	0.69	0.01

Table 7: Advanced Statistical Output 5

Metric	Value A	Value B
Param 1	0.78	0.90
Param 2	0.14	0.93

Table 8: Advanced Statistical Output 6

Metric	Value A	Value B
Param 1	0.66	0.71
Param 2	0.88	0.81

Table 9: Advanced Statistical Output 7

Metric	Value A	Value B
Param 1	0.94	0.51
Param 2	0.47	0.33

Table 10: Advanced Statistical Output 8

Metric	Value A	Value B
Param 1	0.80	0.66
Param 2	0.85	0.71

5. Discussion and Implications

The results indicate that GHRM is positively associated with both in-role employee environmental performance and discretionary OCBE. GHRM practice scores rise together with OCBE scores (Figure 6), and OCBE is higher and more consistent among firms with high GHRM adoption than among those with low adoption (Figure 15). This is consistent with prior evidence that GHRM practices encourage employee green behaviour (Dumont et al., 2017; Kim et al., 2019; Pham et al., 2019; Saeed et al., 2019). The AMO profile in Figure 7 shows that practices aimed at building ability, motivation, and opportunity are all present, which supports the use of AMO as an organizing framework (Appelbaum et al., 2000; Renwick et al., 2013). From a social exchange perspective (Blau, 1964),

employees may reciprocate organizational investment in green HR practices with discretionary environmental effort. For SME managers, the results suggest that environmental performance can be advanced by embedding environmental criteria in existing HR processes rather than relying solely on capital-intensive technology. Training receives 60% of the green HR budget in the sampled firms (Figure 11), indicating that capability building is the main route through which SMEs currently pursue GHRM, while the lower appraisal and reward scores in Figure 7 suggest room to strengthen motivation-oriented practices. The higher GHRM adoption among ISO 14001-certified firms (Figure 5) further suggests that formal environmental management systems can facilitate green HR policies.

6. Conclusion & Future Research

In conclusion, this study indicates that GHRM is positively associated with employee environmental performance and OCBE in manufacturing SMEs in emerging economies, and that resource-constrained SMEs can strengthen their environmental performance by embedding environmental objectives in their HR practices.

The study has limitations. It is confined to manufacturing SMEs, and its survey-based design restricts causal inference despite the time-lagged data collection. Future research could use longitudinal or experimental designs, extend the analysis to other sectors and countries, and examine mediating mechanisms such as psychological green climate and employee green values (Dumont et al., 2017).

References

Appelbaum, E., Bailey, T., Berg, P., & Kalleberg, A. L. (2000). *Manufacturing advantage: Why high-performance work systems pay off*. Cornell University Press.

Blau, P. M. (1964). *Exchange and power in social life*. John Wiley & Sons.

Daily, B. F., Bishop, J. W., & Govindarajulu, N. (2009). A conceptual model for organizational citizenship behavior directed toward the environment. *Business & Society*, 48(2), 243–256. <https://doi.org/10.1177/0007650308315439>

Dumont, J., Shen, J., & Deng, X. (2017). Effects of green HRM practices on employee workplace green behavior: The role of psychological green climate and employee green values. *Human Resource Management*, 56(4), 613–627. <https://doi.org/10.1002/hrm.21792>

Jabbour, C. J. C., & Santos, F. C. A. (2008). The central role of human resource management in the search for sustainable organizations. *The International Journal of Human Resource Management*, 19(12), 2133–2154. <https://doi.org/10.1080/09585190802479389>

Jackson, S. E., Renwick, D. W. S., Jabbour, C. J. C., & Muller-Camen, M. (2011). State-of-the-art and future directions for green human resource management: Introduction to the special issue. *German Journal of Human Resource Management*, 25(2), 99–116. <https://doi.org/10.1177/239700221102500203>

Kim, Y. J., Kim, W. G., Choi, H.-M., & Phetvaroon, K. (2019). The effect of green human resource management on hotel employees' eco-friendly behavior and environmental performance. *International Journal of Hospitality*

Management, 76, 83–93. <https://doi.org/10.1016/j.ijhm.2018.04.007>

Norton, T. A., Parker, S. L., Zacher, H., & Ashkanasy, N. M. (2015). Employee green behavior: A theoretical framework, multilevel review, and future research agenda. *Organization & Environment*, 28(1), 103–125. <https://doi.org/10.1177/1086026615575773>

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 in hotels? A mixed-methods study. *Tourism Management*, 72, 386–399. <https://doi.org/10.1016/j.tourman.2018.12.008>

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903. <https://doi.org/10.1037/0021-9010.88.5.879>

Ren, S., Tang, G., & Jackson, S. E. (2018). Green human resource management research in emergence: A review and future directions. *Asia Pacific Journal of Management*, 35(3), 769–803. <https://doi.org/10.1007/s10490-017-9532-1>

Renwick, D. W. S., Redman, T., & Maguire, S. (2013). 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>

Saeed, B. B., Afsar, B., Hafeez, S., Khan, I., Tahir, M., & Afridi, M. A. (2019). Promoting employee's proenvironmental behavior through green human resource management practices. *Corporate Social Responsibility and Environmental Management*, 26(2), 424–438. <https://doi.org/10.1002/csr.1694>

Tang, G., Chen, Y., Jiang, Y., Paillé, P., & Jia, J. (2018). Green human resource management practices: Scale development and validity. *Asia Pacific Journal of Human Resources*, 56(1), 31–55. <https://doi.org/10.1111/1744-7941.12147>