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ARTICLE

Green HRM and Green Port Performance: Evidence from Turkish Ports Using SEM

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ABSTRACT

In today's globalized world, the surge in international trade has propelled maritime transportation to the forefront, underscoring the indispensable role of ports in facilitating global commerce. However, the consequential environmental footprint of maritime activities has become increasingly undeniable, prompting a critical reassessment of sustainability practices within port operations. To address these concerns, the implementation of environmentally friendly port practices has gained momentum worldwide as a strategic imperative to reduce ecological effects. This research investigates the significant power of green human resource management approaches on enhancing green port performance, utilizing data from ports in Turkey. SEM results indicate that Green human resource management positively influences green port performance, with green training having the strongest effect ($\beta = 0.504$) and green performance management the weakest ($\beta = 0.050$). Although green awareness significantly affects green port performance, the effect is weak. Green human resource management practices are instrumental in fostering environmentally responsible behaviors among employees and reducing environmental footprints within port operations. These practices not only foster an environmentally aware organizational culture but also elevate employees' awareness of sustainability issues, thus contributing to enhanced environmental performance within ports. The findings underscore a positive association between

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Green human resource management and green port performance. While factors like green awareness and creativity were explored, they were found not to mediate or moderate this relationship significantly. Nevertheless, the study highlights the essential impact of actions to strengthen environmental sustainability in the maritime industry, providing insightful directions for future research and strategic policymaking.

Keywords: Green HRM; Green Port Performance; Green Creativity; Green Awareness; SEM; Turkish Ports

1. Introduction

Sustainability has emerged as a pressing global concern, capturing widespread attention across various sectors. Consequently, businesses are facing escalating pressure from stakeholders to address and mitigate the environmental impact stemming from their operations. Growing awareness of environmental responsibility has triggered organizations to reassess their operations and explore strategies to reduce their ecological impact. Business leaders are increasingly acknowledging the significance of sustainability and incorporating environmental management practices into their strategic frameworks. In this context, Green Human Resource Management (GHRM) practices have become a key driver of sustainable organizational initiatives. GHRM involves human resources (HR) practices that aim to embed environmental considerations into an organization's workforce management, thereby fostering behaviors that contribute to ecological goals [1–5]. Human Resource Management (HRM) practices—including recruitment, development and training, performance assesment, and reward systems—can be instrumental in aligning employee behaviour with sustainability goals. By integrating these practices, organizations can effectively synchronize their objectives with broader sustainability imperatives [6,7]. By intertwining HRM strategies with environmental initiatives, GHRM not only serves as a conduit for enhancing environmental performance but also reinforces the organization's commitment to long-term sustainability goals [8–10]. This symbiotic relationship between GHRM and sustainability highlights the significant influence of HRM in shaping organizational conduct and promoting a culture of environmental stewardship [11,12].

To deepen the comprehension of the connection between GHRM drills and environmental fulfillment, various theoretical frameworks have been introduced. A notable approach is the Ability-Motivation-Opportunity (AMO) framework, introduced by Appelbaum et al. [13], which provides a comprehensive perspective on how HR practices enhance organizational green performance (GP). This framework posits that organizational outcomes are shaped by practices that enhance employees' abilities, stimulate motivation, and create opportunities for active participation. These dimensions align closely with the objectives of GHRM, which seeks to embed environmental sustainability within HR functions. For example, ability-enhancing initiatives, such as environmental training, equip employees with the essential skills and expertise to adopt eco-friendly behaviors, while motivational mechanisms, such as green incentives, foster commitment to sustainability goals. Additionally, opportunity-enhancing practices, including participatory environmental programs, empower employees to actively support the organization's environmental initiatives [14,15].

Whilst previous studies emphasize the significance of GHRM across various industries [16,17], research on its specific implementation within the port sector remains limited. Given their operational complexity and strategic role in global logistics, ports are particularly critical in sustainability efforts. Greenhouse gas emissions, oil spills, and other pollutants resulting from port operations and maritime activities have severely impacted marine ecosystems and public health. Integrating GHRM practices throughout the port workforce lifecycle—including recruitment, training, performance evaluation, and incentive systems—can cultivate a workforce that is environmentally aware and proactive. These practices encourage a culture of environmental accountability, leading to lower emissions, improved waste management, and enhanced ecological performance in port operations. However, the pathways through which GHRM strategies effect green port performance remain insufficiently explored. Addressing this gap, the current study investigates the impact of GHRM on enhancing green port performance (GPP), specifically examining the facilitating function of green creativity (GC) and the balancing role of green awareness (GA).

A key dimension of GHRM's influence is its capacity to foster GC, which refers to the creation of innovative and functional solutions designed to foster ecological balance within organizations. By integrating green values into primary HR tasks encompassing staffing, training, performance assessment and reward systems, GHRM not only encourages pro-environmental behaviors but also cultivates a workplace culture that motivates employees to generate sustainable innovations [18–20]. GC, in turn, serves as a catalyst for eco-friendly innovation, enabling the creation of low-carbon products, processes, and strategies.

Simultaneously, GA—defined as employees' recognition of and devotion to environmental sustainability serves as a stabilizing factor in this connection, influencing both their individual and occupational lives [21,22]. Staff members with strong GA are more inclined to embrace and adopt organizational sustainability objectives and actively engage with GHRM initiatives. Their heightened sensitivity to ecological concerns enables them to identify sustainability opportunities and contribute meaningfully to GC. Conversely, low green awareness can diminish the effectiveness of GHRM practices, as employees may lack the intrinsic motivation necessary to adopt and champion sustainable behaviors.

This study builds on prior research by examining these interconnected mechanisms and addressing the call for deeper insights into the internal processes that drive green performance in complex organizational contexts [23,24]. By doing so, this study makes notable insights to the literature. Firstly, it expands the application of GHRM by examining its role in shaping environmental outcomes in the port sector, a field that has been relatively underexplored in academic research. Given the strategic role of ports in global trade and their significant environmental impacts, understanding how GHRM practices influence GPP in this context is critical. This study addresses this gap by examining not only the direct effects of GHRM and its sub-dimensions on GPP, but also the potential mediating role of GC and the moderating role of GA, thereby providing empirical insights into the mechanisms through which HR practices foster sustainability in complex maritime operations. Finally, it responds to calls for more empirical evidence on the mechanisms linking GHRM to organizational outcomes, particularly in high-impact sectors like ports.

2. Theoretical Backgrounds and Hypotheses Development

2.1. Green Human Resource Management and Green Port Performance

GHRM has arisen as a key operational tool for entities striving to enhance environmental performance. This concept integrates environmental goals into various HR policies and approaches encompassing eco-conscious recruitment, training, performance evaluation, and staff involvement [5,8]. The foundation for connecting HR functions with cleaner production can be traced back to Goel's pioneering research, which illustrated an advantageous connection between green HR regulations and earth-related Corporate Social Responsibility (CSR) outcomes. His study suggested that an environmentally conscious HR framework could significantly enhance a company's environmental compliance, encouraging employees to engage in recycling, reuse, renewable energy, and product weight reduction initiatives.

Additional research supports the notion that employee commitment and competencies are crucial in fostering a proactive workforce capable of improving pollution control technologies and maintaining environmental standards in industrial settings. For instance, Jabbour et al. [25] argue that embedding environmental criteria into HR processes encourages employees to adopt more sustainable behaviors. Mechanisms such as training programs that build environmental knowledge, performance appraisals incorporating green objectives, and reward systems promoting eco-friendly practices have been identified as effective ways to create an organizational culture centered on environmental sustainability [2]. Such practices ultimately lead to improved environmental performance.

Empirical findings indicate that GHRM significantly enhances environmental performance across various sectors, including logistics and manufacturing. Amrutha and Geetha [11] and Dubey and colleagues [9] highlighted that companies with strong GHRM initiatives achieve better environmental outcomes. Similarly, Jamil et al. [26] searched the power of green recruitment on sustainability and concluded that effective green hiring practices substantially contribute to achieving environmental goals. This perspective extends to the port industry, where GHRM practices could have a key role in advancing GPP. Given that ports are intricate entities pivotal to global supply chains, their operations inherently produce environmental impacts, such as emissions, waste, and high energy consumption [27]. Hence, there is mounting pressure on ports to adopt sustainable practices to mitigate their environmental footprint.

GHRM practices appear transformative in addressing these challenges. Through targeted training programs, ports can provide employees with the essential knowledge and skills to apply best practices aimed at reducing emissions and minimizing waste. Performance management systems that assess and reward environmentally conscious behaviors help maintain consistency in sustainability efforts. Employee participation in efforts like waste reduction and energy conservation further amplifies these outcomes, fostering a collective commitment to environmental stewardship. By embedding GHRM into their operational frameworks, ports can cultivate a green organizational culture, encouraging behaviors that support sustainability goals. For example, green training programs can educate port workers on effective waste and emission reduction strategies, while green performance management systems ensure that these practices are systematically applied and recognized [3,28]. Employee participation in environmental campaigns, such as energy-saving or recycling initiatives, can further bolster a port's environmental performance [29].

The weight of empirical evidence indicates that GHRM has a notable affirmative effect on green performance. Strategically implementing these practices allows ports to not only shrink their environmental influence but also advance sustainable business models. This underscores the importance of prioritizing GHRM as a core element of port sustainability strategies. Given the strategic significance of ports in global trade and the escalating environmental challenges they face, examining the impact of GHRM on their environmental performance is both timely and essential.

Building upon these practical foundations, this study conceptualizes GHRM as a strategic system through the lens of the Ability–Motivation–Opportunity (AMO) framework. In the port context, where environmental performance depends heavily on employees' operational decisions, GHRM practices serve as the primary mechanism through which human capital is aligned with sustainability objectives. We posit that AMO Theory provides the structural foundation by ensuring employees have the necessary green skills (Ability), motivation through rewards (Motivation), and platforms for participation (Opportunity). Specifically, Green Recruitment and Selection (H1a) and Green Training (H1c) fulfill the 'Ability' dimension by ensuring the workforce possesses the requisite ecological knowledge and technical skills to manage port-specific environmental risks. Green Performance Management (H1d) and Green Compensation and Rewards (H1e) address the 'Motivation' dimension by creating a reinforcement system that aligns individual efforts with the port's sustainability goals through tangible and intangible incentives. Finally, Green Involvement (H1b) serves the 'Opportunity' dimension, providing employees with the autonomy and platforms to contribute their tacit operational knowledge to eco-friendly decision-making processes. By integrating these three pillars, GHRM systematically enhances the collective capacity of the port to achieve superior environmental performance. Accordingly, the following hypotheses are submitted:

H1. *GHRM positively affects GPP.*

H1a. *The green recruitment and selection dimension of GHRM positively affects GPP.*

H1b. *The green involvement dimension of GHRM positively affects GPP.*

H1c. *The green training dimension of GHRM positively affects GPP.*

H1d. *The green performance management dimension of GHRM positively affects GPP.*

H1e. *The green compensation and rewards dimension of GHRM positively affects GPP.*

These hypotheses posit that the integration and execution of GHRM within ports will result in enhanced environmental performance, thereby contributing to the sustainability of the maritime industry.

2.2. Green Human Resource Management, Green Creativity, and Green Port Performance

The componential theory of creativity posits that creativity flourishes as individuals possess expertise in their field, think innovatively, and are driven by intrinsic motivation—factors significantly influenced by organizational culture and support systems [30]. Within this framework, GHRM serves as a catalyst for GC by fostering an environment that encourages staff to develop innovative alternatives for sustainability concerns. By incorporating green training initiatives, eco-conscious performance assessments, and incentive structures for sustainable behaviors, GHRM cultivates a culture that supports creativity and innovation, thereby enhancing GPP [31].

This complex interplay is illustrated in research by Chen et al. [32], who investigate how GHRM influences employees' discretionary green behaviors in resource-heavy industries such as oil and mining. Their findings indicate that these voluntary behaviors contribute to sustainability and operational efficiency through waste reduction and energy conservation. Similarly, Song et al. [33] highlight that integrating GHRM practices with strong managerial commitment to environmental priorities significantly enhances green innovation, enabling firms to tackle environmental challenges more effectively while balancing sustainability and innovation.

Further insights into GHRM's role emerge from Shah et al. [24], who explore its impact onenvironmental economic performance, highlighting the intermediary functions of organizational culture and psychological climate.. Their findings suggest that a well-structured GHRM strategy not only improves environmental performance but also strengthens competitive advantage. Likewise, Cesário et al. [34] argue that incorporating environmental management principles within HR systems increases employee engagement and organizational effectiveness, demonstrating that organizations embedding GHRM practices can sustain long-term competitiveness while fulfilling sustainability objectives.

An in-depth perspective on GHRM also considers the significance of employee engagement. Naya [35] stresses that worker involvement in environmental endeavors is crucial for the effectiveness of sustainability programs, shifting the focus from a top-down model to a more inclusive approach that empowers employees to drive green initiatives. Adding to this perspective, Fang and co-authors [36] explore the intermediary action of green innovation and organizational culture in the GHRM-environmental fullfilment relationship, illustrating how a robust green culture amplifies the effect of GHRM strategies and improves both environmental and organizational outcomes.

The empirical evidence substantiating GHRM's broad impact is extensive. For instance, Munawar and associates [37] report that GHRM fosters environmental innovation by enhancing green human capital and increasing employees' environmental expertise, enabling them to devise sustainable and innovative solutions. Similarly, Farooq et al. [19] reveal that GHRM adoption in luxury hotels stimulates GC, where heightened environmental awareness facilitates the execution of sustainable practices. In addition, Karatepe et al. [38] highlight the part played by perceived green organizational assistance in reinforcing employees' pro-environmental behaviors, aligning individual efforts with the organization's overarching sustainability objectives.

In the context of port operations—characterized by stringent international safety regulations (e.g., IMO, MARPOL) and highly standardized logistical workflows—GHRM practices act as the structural framework for sustainability. While green training enhances environmental expertise and reward systems provide the extrinsic motivation, these administrative tools often focus on routine compliance. However, port environments are inherently volatile and operationally complex, particularly during berthing, bunkering, and hazardous material handling, where standardized procedures may not cover every environmental contingency.

Within this framework, Green Creativity (GC) emerges as a critical mediating mechanism because it provides the 'cognitive flexibility' required to bridge the gap between static HR policies and dynamic operational realities. According to the Componential Theory of Creativity, expertise and motivation must be funneled through creative thinking to produce novel outcomes. In ports, GC is the functional catalyst that enables employees to move beyond mere compliance and develop site-specific, non-routine solutions—such as optimizing energy use in terminal movements or mitigating accidental spill risks—that generic GHRM policies cannot prescribe. Therefore, without the mediating role of GC, GHRM remains a procedural exercise; it is the creativity of the workforce that transforms latent human capital into the innovative operational outputs necessary for Green Port Performance (GPP). In light of these theoretical and contextual justifications, GHRM is expected to foster a creative climate that, in turn, drives superior environmental outcomes. Accordingly, the following hypotheses are submitted:

H2. *GHRM positively influences GC.*

H3. *GC mediates the link between GHRM and GPP.*

2.3. Green Human Resource Management, Green Awareness, and Green Port Performance

GA encompasses a mindset that motivates individuals to safeguard the environment, minimize harmful actions, and adopt sustainable behaviors. Staff who receive instruction in environmental responsibility are more likely to implement eco-friendly practices, whether driven by organizational policies, personal beliefs, or heightened awareness [22]. Organizations can cultivate an environmentally conscious workforce by embedding green policies into HRM strategies, thereby strengthening employees' commitment to sustainability. When individuals understand the broader impact of their actions, they are more disposed to engage in pro-environmental actions. Encouraging green practices through emotional commitment and continuous adaptation in the workplace further reinforces this process.

Social Learning Theory provides an outline for understanding how employees develop green awareness. This theory posits that humans procure behaviours by monitoring and emulating others within a conducive environment. GHRM actions likewise green coaching programs and environmentally aligned performance evaluation, help create a culture rooted in sustainability, nurturing GA and behaviors that contribute to GPP. Furthermore, Organizational Support Theory [39] asserts that employees who perceive strong institutional commitment to environmental initiatives are more inclined to adopt sustainable practices, thereby enhancing GPP.

While GHRM establishes formal structures and incentives for environmental management, its effectiveness in improving green port performance depends on employees' level of green awareness. Employees with high green awareness are more likely to interpret GHRM practices as meaningful signals of organizational environmental commitment, leading to stronger behavioral alignment with sustainability objectives. In contrast, when green awareness is low, GHRM practices may be perceived as symbolic or compliance-driven, limiting their impact on actual environmental performance. Therefore, green awareness strengthens the relationship between GHRM and green port performance by amplifying employees' responsiveness to green HR initiatives. Empirical research supports these theoretical perspectives. Studies indicate that GHRM, together with green transformational leadership and innovation, positively influences eco-performance in ports [40,41]. Additionally, GHRM improves sustainability outcomes, with employee awareness serving as a critical factor that amplifies its effects [42]. These results underscore the vital function of GHRM in embedding sustainability by fostering employee awareness and reinforcing environmental values.

Leadership plays a vital role in reinforcing the bond between GHRM and GPP. Servant leadership, characterized by ethical decision-making and a focus on employee development, enhances GHRM's effectiveness in promoting sustainable behaviors [22]. By cultivating a culture centered on sustainability, servant leaders in port management motivate employees to participate in green initiatives, leading to improved environmental outcomes. Additionally, green intellectual capital, which includes employees' environmental knowledge, skills, and innovative capabilities, is vital in translating GHRM into tangible improvements in environmental performance [43]. Ports that devote resources to training programs to build green skills among employees are better positioned to effectuate sustainable management methods like eco-friendly logistics and energy-efficient port operations.

Employee engagement in eco-friendly behaviors acts as an intermediary in the connection between GHRM and GP. Studies indicate that when employees recognize significant organizational support for sustainability, they are more tend to demonstrate pro-environmental actions [44]. Within port operations, this translates into actions such as minimizing resource consumption, adhering to pollution control standards, and contributing to green innovation efforts.

GHRM also fosters green innovation, which is essential for sustainable port operations. Implementing green HR practices encourages employees to develop and execute innovative environmental solutions, including renewable energy adoption and waste recycling programs [45]. As a result, ports that align HRM strategies with green innovation goals can significantly enhance their sustainability performance.

Organizational support mechanisms, such as incentive programs and employee engagement initiatives, further reinforce green behaviors among port workers. Empirical findings indicate that employee engagement plays an important part in the GHRM-environmental performance relationship, as engaged employees demonstrate higher commitment to sustainability efforts [46]. In port settings, strategies like recognition programs and participatory decision-making processes can further elevate green behaviors and environmental performance. In summary, the interplay between GHRM, GA, and GPP underscores the importance of human capital in advancing sustainable port operations. By integrating green HR practices into organizational strategies, fostering environmental consciousness, and leveraging leadership support, ports can substantially improve their environmental outcomes. Accordingly, green awareness is expected to condition the strength of the relationship between GHRM and green port performance rather than exerting a direct effect. Building on these insights, we formulate the following hypothesis:

H4. *GA moderates the relationship between GHRM and GPP, strengthening it when awareness is high.*

3. Materials and Methods

This study judges the domination of GHRM on GPP, a topic of growing importance in the realm of sustainable port operations. Employing Structural Equation Modeling (SEM), the study not only estimates the direct connection between GHRM and GPP but also judges the facilitating role of GC and the regulatory function of GA (**Figure 1**). These additional dimensions—creativity and awareness—are essential for understanding the broader implications of GHRM practices in driving sustainable performance outcomes within port operations.

The hypotheses proposed in the study were assessed through a comprehensive survey conducted across various ports in Turkey. The decision to focus on Turkish ports is driven by both national and global considerations, ensuring the findings hold relevance for international port managers and policymakers. Strategically located at the intersection of Europe, Asia, and the Middle East, Turkey's ports serve as critical hubs for global trade and logistics. This strategic significance, coupled with increasingly stringent environmental regulations, makes Turkey an ideal case for assessing the contribution of GHRM practices to port sustainability.

Additionally, Turkey has demonstrated a strong commitment to eco-friendly practices in maritime activities. The "Green Port/Eco Port" initiative, launched on December 16, 2014, by the Turkish government in collaboration with the Turkish Standards Institution (TSE), underscores the country's proactive approach to fostering sustainable port management. Moreover, Turkey's engagement with international entities like the European Union and the European Bank for Reconstruction and Development (EBRD) further highlights its dedication to aligning port operations with global sustainability standards. These initiatives provide a valuable reference point for other regions striving to balance regulatory compliance with environmental sustainability.

By analyzing this context, the study not only sheds light on Turkey's experience but also offers broader insights applicable to ports worldwide facing similar regulatory and sustainability challenges.

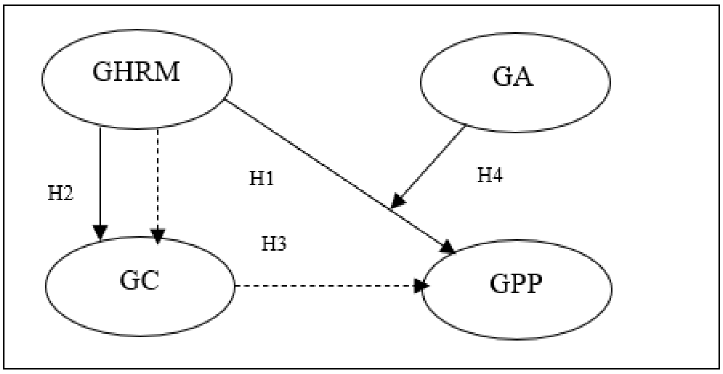

Figure 1. The hypothesized model of the study.

3.1. Data Collection and the Sample

Data were collected from employees working in port operations across the Marmara region. Of the 250 questionnaires distributed, 210 were returned fully completed and deemed suitable for analysis, yielding a response rate of 84.0%. The surveys were administered online to facilitate ease of participation. Common method bias (CMB) was assessed using multiple complementary procedures. Although Harman's single-factor test indicated that a single factor accounted for 54.23% of the total variance, this test alone is insufficient to diagnose CMB [47]. Therefore, the marker variable approach proposed by Lindell and Whitney was applied [48]. The marker variable was constructed by averaging two items that were excluded from the final CFA due to low factor loadings and were not conceptually related to the focal constructs [49]. A hierarchical regression analysis revealed that the inclusion of the marker variable resulted in a negligible and statistically non-significant change in explained variance ($\Delta R^2 = 0.003$, $p > 0.05$), and the substantive relationships remained stable.

As an additional robustness check, a latent method factor model was estimated. Although some items loaded on the method factor while others did not, the pattern of loadings was inconsistent across constructs. Importantly, the inclusion of the latent method factor did not alter the magnitude, direction, or statistical significance of the hypothesized structural relationships. Consistent with prior methodological recommendations, these results were therefore interpreted with caution and were not taken as evidence of substantive common method bias. Overall, these findings suggest that common method bias is unlikely to substantially affect the study's conclusions.

Among the participants in the survey conducted within port enterprises, 22.4% were women, and 77.6% were men. The majority of participants 58.1%, were aged between 26 and 35 years. Additionally, 56.2% were university graduates, 25.7% had been working at the same port for 1 to 3 years, 46.2% were employed at container ports, and 40% held mid-level positions.

3.2. The Measurement of the Constructs

The survey items in this study are measured using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The study utilized well-established scales to measure the various constructs relevant to GHRM, GA, GC, and GPP. The measurement instruments were selected based on their reliability and relevance to the research objectives.

3.2.1. Green Human Resource Management

The GHRM construct was assessed using a multi-dimensional scale encompassing five distinct dimensions: green recruitment, green training, green participation, green performance management, and green compensation and rewards. The scale used was developed by Tang and associates [2] and further refined by Mousa and Othman [50]. This comprehensive approach ensures a thorough evaluation of GHRM practices within organizations, reflecting their various facets and contributions to environmental sustainability.

3.2.2. Green Awareness

Green awareness was measured using a unidimensional scale designed to capture the general environmental consciousness among individuals. The scale employed is based on the work of Kalyar et al. [51], who provided a robust framework for assessing awareness of environmental issues in the context of organizational behavior.

3.2.3. Green Creativity

The construct of GC was also measured using a unidimensional scale, focusing on the innovative aspects of environmental management within organizations. This scale is grounded in the research conducted by Chen and Chang [31], which provides insights into how creative approaches contribute to green initiatives.

3.2.4. Green Port Performance

For assessing GPP, a six-dimensional scale was used. This scale evaluates various aspects of environmental management within ports, including air pollution control, marine ecological protection, noise control, biological system preservation, liquid pollution management, and low carbon and energy conservation management. The dimensions were derived from the studies by Zhao et al. [52], Kline [53], and Bucak [54]. This detailed approach allows for a comprehensive assessment of environmental performance in port operations.

To ensure linguistic and conceptual equivalence, a double-translation (back-translation) procedure was employed. First, the original English scales were translated into Turkish by the research team, including a co-author who is an English language instructor. Subsequently, to verify the accuracy of the Turkish version, the items were back-translated into English by independent language experts from the Department of Foreign Languages at Kocaeli University. The two English versions (original and back-translated) were then compared to identify and resolve any conceptual discrepancies, ensuring that the final Turkish instrument accurately captured the nuances of the original constructs.

3.3. Structural Equation Modeling

SEM is a sophisticated multivariate statistical modeling technique that seeks to uncover cause-and-effect relationships between both measured and unmeasured (latent) variables [54,55]. It integrates structural models, which specify the relationships among variables, and measurement models, which assess the reliability and validity of the constructs under study [56]. SEM's versatility makes it particularly well-suited for complex research designs like the present study, where multiple interdependent relationships are explored.

As stated by Raykov and Marcoulides [57], SEM encompasses four primary models: Path Analytic Model (PAM), Confirmatory Factor Analysis (CFA), Structural Regression Model (SRM), and Latent Variable Model (LVM). Among these, the integration of CFA and Path models has become a standard practice for ensuring comprehensive and accurate analysis [58]. This combination allows researchers to simultaneously evaluate the measurement properties of the constructs and their structural relationships, offering a robust framework for theoretical and empirical inquiry.

For the purposes of this study, SEM offers a valuable methodological foundation to examine how GHR practices contribute to GPP and how these effects are influenced by organizational factors like creativity and awareness. Such insights can inform managerial strategies aimed at enhancing the sustainability of port operations through innovative and environmentally conscious human resource practices.

Confirmatory Factor Analysis

CFA is a specialized form of Structural Equation Modeling (SEM) and is frequently employed in construct validity assessments and scale development [59]. Nye's [60] study highlights both the advantages and disadvantages of CFA, offering a balanced perspective on its applicability.

The advantages of CFA include its ability to utilize a wide range of fit indices, making it highly effective for testing theoretical models and particularly useful for models with simple structures. However, its limitations are also noteworthy. These include the complexity of working with intricate datasets, the necessity for advanced expertise in defining the factor structure of the model, and the inherent constraints of fit indices despite their variety.

In CFA, the analytical model with "p" observed variables and "k" common factors is represented by the following equation [61]:

$$y = \Lambda\eta + \epsilon$$

Here:

y: A p × 1p × 1 random vector of observed variables,

Λ: A p × k matrix of factor loadings,

η: A k × 1 vector of common factors,

ϵ: A p × 1 random vector of residuals.

The fit indices for the models were evaluated according to the thresholds presented in **Table 1**. These thresholds provide a systematic framework for assessing the goodness-of-fit of the proposed model, ensuring its reliability and validity for hypothesis testing.

Table 1. SEM fit indices.

Fit Indices	Acceptable Fit	Good Fit
χ^2/df	2 < 5	0 ≤ 2
CFI	0.95 ≤ CFI < 0.97	0.97 ≤ CFI ≤ 1
TLI	0.90 ≤ 0.95	0.95 ≤ 1
GFI	0.85 ≤ GFI < 0.95	0.95 ≤ 1
RMR	0.05 ≤ 0.10	0 ≤ 0.05
RMSEA	0.05 ≤ 0.10	0 ≤ 0.05

3.4. Empirical Results

Among the participants in the survey conducted within port enterprises, 22.4% were women, and 77.6% were men. The majority of respondents, 58.1%, were aged between 26 and 35 years. Additionally, 56.2% were university graduates, 25.7% had been working at the same port for 1 to 3 years, 46.2% were employed at container ports, and 40% held mid-level positions.

3.4.1. Confirmatory Factor Analysis of the Green Human Resources Scale

At the outset, a confirmatory factor analysis (CFA) was conducted for the Green Human Resource Management (GHRM) scale to validate its construct structure. The path diagram illustrating the relationships among the latent variables is presented in **Figure 2**. In the diagram, the latent constructs are represented using the following abbreviations: Green Recruitment and Selection (GRS), Green Involvement (GP), Green Training (GRE), Green Performance Management (GPM), and Green Compensation and Rewards (GCR). These abbreviations are used consistently throughout the manuscript for clarity and brevity.

In **Figure 2**, the path diagram for the GHR scale demonstrates construct validity with the following fit index values:

χ^2/df = 2.194, CFI = 0.954, TLI = 0.946, GFI = 0.846, RMR = 0.085 and RMSEA = 0.076. These values fall within the acceptable thresholds outlined in **Table 1**.

During the analysis, item 16 ("This port does not have environmental performance evaluation criteria") was removed due to its factor loading being below 0.5. This adjustment ensures the reliability and validity of the scale by adhering to established statistical criteria.

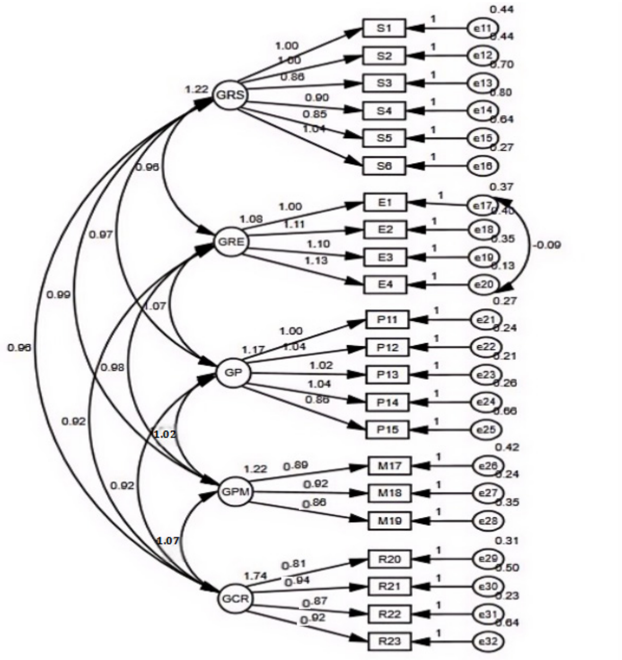

Figure 2. Confirmatory factor analysis of the GHRM scale.

3.4.2. Confirmatory Factor Analysis of the Green Awareness Scale

The path diagram for the GA Scale is presented in **Figure 3**. During the analysis, items 4 ("I am not dependent on others for my decisions") and 6 ("I am rewarded if I share and disseminate new environmental information") were removed as their factor loadings were below 0.5.

The fit indices calculated to assess construct validity were as follows:

χ^2 = 5.019, = 2.510, CFI = 0.991, TLI = 0.972, GFI = 0.989, RMR = 0.031, RMSEA = 0.085

Based on these indices:

CFI, TLI, GFI, and RMR indicate that the model demonstrates a good fit.

RMSEA, however, suggests the model falls within acceptable fit thresholds.

3.4.3. Confirmatory Factor Analysis of the Green Creativity Scale

The fit indices calculated for construct validity were as follows: χ^2/df = 1.856, CFI = 0.997, TLI = 0.992, GFI = 0.986, RMR = 0.009, and RMSEA = 0.064. Based on the CFI, TLI, and GFI indices, the model (presented in **Figure 4**) passes all goodness-of-fit tests demonstrate the model's suitability.

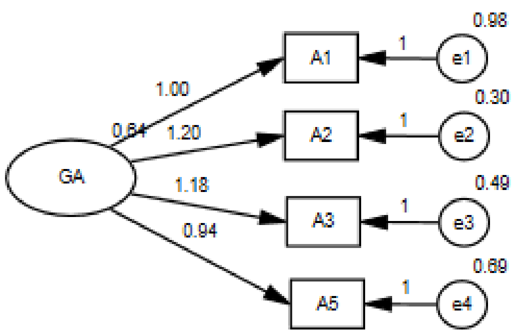

Figure 3. Path diagram of GA scale.

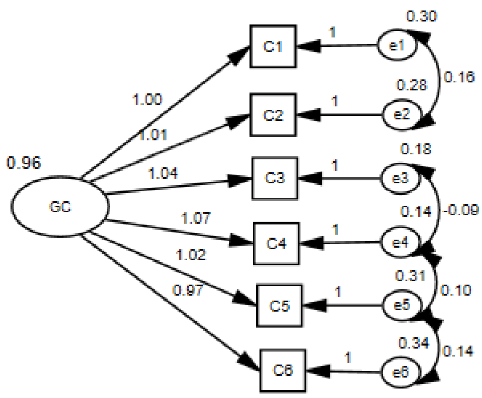

Figure 4. Path diagram of the GC scale.

3.4.4. Confirmatory Factor Analysis of the Green Port Performance Scale

The fit indices calculated for construct validity of the GPP Scale, as presented in **Figure 5**, were: χ^2/df = 2.304, CFI = 0.990, TLI = 0.978, GFI = 0.976, RMR = 0.025, and RMSEA = 0.079.

These results indicate the following:

- The χ^2/df, CFI, and TLI indices suggest acceptable model fit.
- The GFI and RMR indices demonstrate good model fit.
- However, the RMSEA index does not fall within the acceptable fit thresholds.

While most indices confirm a satisfactory level of construct validity, the elevated RMSEA value suggests that some aspects of the model may require further refinement to enhance overall fit.

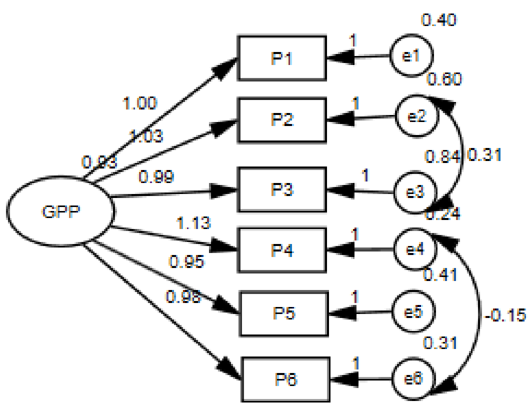

Figure 5. Path diagram of the GPP scale.

3.4.5. Reliability Analysis

The results of the Cronbach's alpha coefficients indicate that the scales used in this study demonstrate high reliability. The number of items and their corresponding Cronbach's alpha values are as follows: Green Recruitment Scale (6 items; α = 0.921), Green Training Scale (4 items; α = 0.939), Green Participation Scale (5 items; α = 0.945), Green Performance Management Scale (3 items; α = 0.921), Green Compensation and Reward Scale (4 items; α = 0.933), Green Human Resources Scale (22 items; α = 0.973), Green Awareness Scale (4 items; α = 0.829), GC Scale (6 items; α = 0.962), Green Port Performance Scale (9 items; α = 0.918)

These high Cronbach's alpha values indicate that the scales are reliable and produce consistent results across their respective constructs.

After determining the Cronbach's alpha coefficients, Composite Reliability, Average Variance Extracted, and discriminant validity were assessed using the Fornell–Larcker Criterion. The results of the analysis are presented in **Table 2**.

Table 2. Reliability 1 (Composite Reliability, Average Variance Extracted, and HTMT).

Factor	CR	AVE	Heterotrait–Monotrait Ratio of Correlations				
			GRS	GRE	GP	GPM	GCR
GRS	0.843	0.666	**0.816**	0.846	0.874	0.656	0.724
GRE	0.907	0.795	0.846	**0.892**	0.959	0.677	0.677
GP	0.922	0.780	0.874	0.959	**0.883**	0.648	0.740
GPM	0.877	0.797	0.656	0.677	0.648	**0.893**	0.737
GCR	0.924	0.785	0.724	0.677	0.740	0.737	**0.886**

For all constructs, Composite Reliability (CR) values ranged from 0.843 to 0.924, .exceeding the recommended threshold of 0.70, indicating that the scales are reliable. The Average Variance Extracted (AVE) values varied between 0.666 and 0.797, all above the 0.50 benchmark, demonstrating that the items adequately capture their respective constructs. As presented in the tables, Heterotrait-Monotrait (HTMT) ratios below 0.85 are considered satisfactory, whereas values between 0.85 and 0.90 are interpreted as borderline. Since none of the HTMT values exceeded 0.90, discriminant validity is supported, suggesting that the constructs are empirically distinct from one another.

As illustrated in **Figures 3–5**, the GA, GC, and GPP scales are modeled as single-factor constructs; therefore, only their Composite Reliability (CR) and Average Variance Extracted (AVE) values were assessed and are reported in **Table 3**. Based on these results, it can be concluded that the scales are reliable and that the items appropriately capture their respective constructs.

Table 3. Reliability 2 (Composite Reliability, Average Variance Extracted).

Dimension	CR	AVE
GPP	0.891	0.648
GA	0.781	0.561
GC	0.949	0.980

3.4.6. Correlation Analysis

The correlation analysis results for the factors examined for construct validity in the study are presented in **Table 4.**

Upon examining the correlation analysis results, a statistically significant, positive, and moderate-level relationship exists among GPP and GHRM, GA, and GC. Whereas, there is a statistically significant and strong bond among GA and GHRM, GC and GHRM, as well as GC and GA. These findings indicate how these constructs interact with each other and show that the relationships between the scales are strong.

Table 4. Correlation.

		GHRM	GA	GC
GHRM	R			
	P			
GA	R	0.775		
	p	0.000		
GC	R	0.764	0.828	
	p	0.000	0.000	
GPP	R	0.564	0.522	0.435
	p	0.000	0.000	0.000

3.4.7. Regression Analyses

The results of the regression analyses are presented in **Table 5**.

According to the SEM regression results presented in **Table 5**, GRE, one of the sub-dimensions of GHRM, has a moderate and statistically significant effect on GPP (β = 0.417, *p* = 0.002). Other sub-dimensions, such as GPM, have very small and non-significant effects on GPP (β = 0.040, *p* = 0.756). Among the sub-dimensions, GRE exhibits the strongest effect, whereas GPM has the weakest effect.

One of the objectives of the study is to determine whether GC mediates the relationship between GHRM and GPP. The boobstrap analysis indicates that while GHRM has a strong and significant effect on GC (β = 0.705, *p* = 0.001). The indirect effect of GHRM on GPP via GC is not significant. This suggests that GC does not play a mediating role in this relationship.

Another objective was to examine whether GA moderates the relationship between GHRM and GPP. The results show that the moderating effect of GA is not significant. To further illustrate the nature of the non-significant moderating effect, a simple slope analysis was conducted and visualized in **Figure 6.** As shown in **Figure 6**, the relationship between GHRM and GPP remains largely parallel across low (−1 SD), mean, and high (+1 SD) levels of green awareness, indicating that variations in green awareness do not meaningfully alter the strength or direction of this relationship.

Table 5. Regression analyses (SEM).

Variable		Boostrap (95%CI)		β	SE	*p*
Depent	Independent	Lower	Upper			
GPP	GRS	[−0.142–0.289]		0.060	0.088	0.507
GPP	GRE	[0.198–0.620]		0.417	0.110	0.002
GPP	GP	[−0.036–0.369]		0.157	0.107	0.138
GPP	GPM	[−0.188–0.233]		0.040	0.088	0.756
GPP	GCR	[−0.204–0.064]		−0.074	0.063	0.290
GPP	GA	[−0.209–0.770]		0.302	0.097	0.229
GPP	GC	[−0.277–0.124]		−0.082	0.093	0.469
GPP	GHRMXGA	[−0.515–0.306]		−0.134	0.029	0.549
GC[a]	GHRM	[1.014–1.382]		0.705	0.047	0.001

Note: *a: Mediating variable.*
N = 210 standard errors are based on maximum likelihood estimation. Confidence intervals are bias-corrected boostrap intervals based on 2000 resamples R^2 for GPP = 0.543, $p < 0.010$.

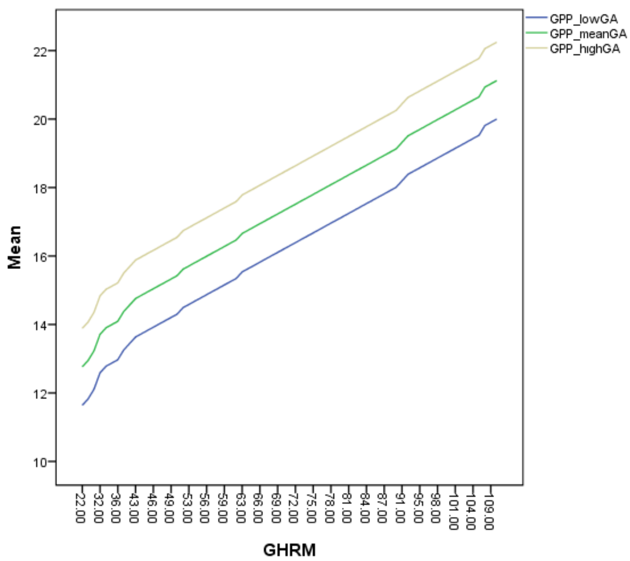

Figure 6. Simple slope analysis of the moderating effect of GA on the relationship between GHRM and GPP.

The model explains 54.3% of the variance in GPP (R^2 = 0.543, p < 0.010). Standard errors were estimated using maximum likelihood(ML), and the confidence intervals are bias-corrected bootstrap intervals based on 2000 resamples, providing robust estimates for the effects.

4. Findings and Discussion

This study searched for the association between GHRM and GPP. In line with the previous studies [22,32], regression analyses revealed a positive and significant association between GHRM and GPP, suggesting that the adoption of green HR practices may contribute to enhanced environmental performance in port operations. The findings indicate that among the GHRM sub-dimensions—green recruitment and selection, green training, green involvement, green performance management, and green compensation and rewards—green training has a positive effect on GPP. These results highlight the critical role of training initiatives in enhancing GPP, reinforcing prior studies that emphasize the importance of employee development in fostering sustainability [62].

The finding that green training is the only significant predictor of GPP (H1c) among all GHRM dimensions is particularly telling for the maritime sector. In the context of Turkish ports in the Maramara Region, this suggests that environmental performance is currently driven more by technical competence than by incentive-based or participatory mechanisms. Ports are highly technical environments where compliance with international standards (e.g., MARPOL) requires specific, hands-on skills. Therefore, targeted training directly impacts operational outcomes by reducing errors and optimizing resource use, whereas compensation (H1e) or recruitment (H1a) may have more distal, long-term effects that are not yet captured in the current operational cycle.

While previous studies [33,45], including Dhaene et al. [61,63], suggest that GC serves as a key mechanism linking GHRM to green outcomes, our findings indicate otherwise. Contrary to the hypothesized expectations, Green Creativity (GC) did not serve as a significant mediator (H3), and Green Awareness (GA) did not moderate the GHRM–GPP relationship (H4). These non-significant results can be attributed to the structural rigidity and high degree of standardization inherent in port operations. Port activities are governed by strict safety protocols and 'just-in-time' logistical pressures, leaving little room for 'discretionary' creative interventions. When workflows are highly routinized to ensure safety and efficiency, individual creativity (GC) may be stifled by hierarchical decision-making structures or fixed operational procedures. Similarly, while GA increases individual sensitivity to environmental issues, its impact on performance is likely constrained by the capital-intensive and hardware-dependent nature of ports; even an aware workforce cannot overcome performance limitations imposed by aging port infrastructure or fixed technological setups. This suggests a 'decoupling' in the port context, where green intentions (GA/GC) are present but cannot be fully translated into GPP due to operational constraints. The results of the hypothesis tests are summarized in **Table 6**.

Table 6. Results of Hypothesis Tests.

Hypotheses	Test Statistic	*p*-Value*	Decision
H1	−0.665	0.506	Rejected
H1a	0.596	0.551	Accepted
H1b	1.406	0.160	Rejected
H1c	3.695	0.000	Accepted
H1d	0.425	0.671	Rejected
H1e	−1.032	0.302	Rejected
H2	14.379	0.000	Accepted
H3	−1.074	0.283	Rejected
H4	−0.563	0.573	Rejected

Note: * Decision rule based on p < 0.05.

4.1. Theoretical Implications

This paper advances knowledge on the theoretical framework of sustainable HRM, particularly within the domain of environmental sustainability. The confirmation of the direct bond between GHRM and GPP aligns with the Resource-Based View theory, which argues internal sources, such as HRM practices, can generate a business superiority in sustainability [64]. Notably, green selection and recruitment, green involvement, green training, and green performance management significantly contribute to GPP, with green training playing a particularly prominent role. These findings suggest that organizations should prioritize training initiatives to develop employees' expertise, abilities, and behaviors that drive environmental sustainability.

The varying strengths of the relationships between GHRM sub-dimensions and GPP highlight the importance of context-specific factors. The weaker relationship observed for green compensation and rewards suggests that while incentive-based strategies are relevant, they may not have the same impact as training or performance management. This underscores the need for organizations to focus on HRM practices that yield more substantial effects on green performance outcomes.

Additionally, the absence of a significant Intervening role of GC challenges the assumption that innovation-oriented mechanisms are primary drivers of the GHRM-GPP relationship. Instead, alternative pathways, such as organizational learning or knowledge-sharing practices, may better explain how GHRM fosters sustainability. Similarly, the lack of significant moderation by GA suggests that while awareness initiatives are essential, they may not actively strengthen the GHRM-GPP link. Future research should explore whether other contextual variables, such as leadership styles or regulatory pressures, play a more significant balancing role.

4.2. Practical Implications

From a managerial perspective, these findings underscore the relevance of implementing effective GHRM practices to enhance GPP. Port authorities and managers should prioritize green training, as it has the most substantial impact on GPP. Investing in training programs can help employees develop the required capabilities to execute sustainability initiatives effectively.

While GA and GC remain important components of sustainable HRM, the current findings indicate that they may not directly enhance GPP as expected. Port managers should therefore focus on strengthening core GHRM practices such as green training and performance management, rather than relying solely on awareness or creativity initiatives. The limited impact of green compensation and rewards suggests that organizations may need to design more effective incentive mechanisms that better align employee motivation with sustainability objectives in port operations.

4.3. Limitations and Future Research

Despite its contributions, the present study has certain limitations. First, the sampling frame is restricted to ports in the Marmara Region. Although this region serves as Turkey's primary maritime hub and accounts for a significant portion of its total trade volume, this geographical concentration may limit the generalizability of the findings to all Turkish ports. Future research should encompass a broader national or international sampling frame to validate these results across diverse coastal regions. Using cross-sectional data constrains the power to build causal relations. Upcoming research should adopt longitudinal designs to investigate the long-range impact of GHRM practices on GPP. Additionally, scrutinizing alternative mediators such as organizational learning, knowledge-sharing, or leadership approaches could deliver a more thorough understanding of how GHRM influences green port performance.

Future studies should also investigate different industry contexts to assess whether the findings are generalizable beyond the maritime sector. Furthermore, additional balancing variables—such as regulatory frameworks, cultural influences, or technological advancements—could be examined to determine their role in shaping the GHRM-GPP relationship.

By tackling these research gaps, upcoming studies can further refine our comprehension of how GHRM practices contribute to sustainable port operations and broader environmental sustainability goals.

5. Conclusion

This study examined the relationship between GHRM practices and GPP in ports operating in the Marmara Region of Turkey. The results indicate that GHRM has a generally positive and significant effect on GPP. However, when the sub-dimensions were analyzed, green training emerged as the only significant predictor among the five dimensions tested, demonstrating that improvements in environmental performance in port operations can primarily be achieved through the development of green competencies via training initiatives.

One of the most striking findings of the study is that factors such as GC and GA did not play the expected roles in the GHRM–GPP relationship. This outcome may be attributed to the highly standardized, safety and security-oriented nature of port operations, which are subject to strict international regulations (e.g., MARPOL). Even when employees possess individual-level environmental awareness and creative potential, the hierarchical structure of ports and their highly planned, routine workflows may prevent these attributes from being translated into measurable performance outcomes.

In conclusion, the findings suggest that in high-risk industries such as ports, placing green training at the center of human resource strategies is crucial for achieving green transformation. In other words, the study concludes that the effectiveness of GHRM is highly dependent on sectoral context and that green training should be prioritized as the most critical human resource lever to support sustainability objectives in port operations.

Author Contributions

Conceptualization, G.K.Ö. and Ö.A.; data curation; formal analysis, Ö.A. and A.Ş.K.; investigation, Ö.A.; resources, Ö.A.; G.K.Ö., and A.Ş.K.; writing—original draft preparation, G.K.Ö., Ö.A. and A.Ş.K.; writing—review and editing, G.K.Ö. and A.Ş.K.; supervision, G.K.Ö. and A.Ş.K. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

The questionnaire and methodology for this study were approved by the Ethics Committee of Kocaeli University (Ethics approval number: E-10017888-100-333328). This study was conducted in accordance with the ethical guidelines of the American Psychological Association (APA).

Informed Consent Statement

Informed consent was obtained from all individual participants included in the study.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to privacy restrictions related to the institutional ethics committee approval and the confidentiality agreements made with the participating port organizations.

Conflicts of Interest

The authors declare no conflict of interest.

AI Use Statement

The authors used OpenAI-ChatGPT solely for grammar checking, sentence structure refinement, and improving the readability of the English text in this manuscript. The authors take full responsibility for all academic content, including all ideas, data, analyses, and conclusions presented herein. The use of AI was thoroughly reviewed and supervised by the authors.

References

[1] Muisyo, P.K., Qin, S., Ho, T.H., et al., 2022. The effect of green HRM practices on green competitive advantage of manufacturing firms. Journal of Manufacturing Technology Management. 32(1), 22–40.

[2] Tang, G., Chen, Y., Jiang, Y., et al., 2018. Green human resource management practices: Scale development and validity. Asia Pacific Journal of Human Resources. 56(1), 31–55.

[3] Jabbour, C.J.C., 2015. Environmental training and environmental management maturity of Brazilian companies with ISO14001: Empirical evidence. Journal of Cleaner Production. 96, 331–338.

[4] Paillé, P., Chen, Y., Boiral, O., et al., 2014. The impact of human resource management on environmental performance: An employee-level study. Journal of Business Ethics. 121, 451–466.

[5] 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.

[6] Al-Alawneh, R., Othman, M., Zaid, A.A., 2023. Green HRM impact on environmental performance in higher education with mediating roles of management support and green culture. International Journal of Organizational Analysis. 32(6), 1141–1164.

[7] Sobaih, A.E.E., Hasanein, A., Elshaer, I., 2020. Influences of green human resources management on environmental performance in small lodging enterprises: The role of green innovation. Sustainability. 12(24), 10371.

[8] Jabbour, C.J.C., de Sousa Jabbour, A.B.L., 2016. Green human resource management and green supply chain management: Linking two emerging agendas. Journal of Cleaner Production. 112(Part 3), 1824–1833.

[9] Dubey, R., Gunasekaran, A., Helo, P., et al., 2016. Explaining the impact of reconfigurable manufacturing systems on environmental performance: The role of green human resource management. Journal of Cleaner Production. 141, 56–66.

[10] Sahan, U.M.H., Jaaffar, A.H.H., Osabohien, R., 2025. Green human resource management, energy saving behavior and environmental performance: A systematic literature review. International Journal of Energy Sector Management. 19(1), 220–237. DOI: https://doi.org/10.1108/IJESM-01-2024-0013

[11] Amrutha, V.N., Geetha, M., 2020. A systematic review on green human resource management: Implications for social sustainability. Journal of Cleaner Production. 247, 119131.

[12] Aggarwal, P., Agarwala, T., 2022. Relationship of green human resource management with environmental performance: Mediating effect of green organizational culture. Benchmarking: An International Journal. 30(7), 2351–2376.

[13] Appelbaum, E., Bailey, T., Berg, P., et al., 2000. Manufacturing Advantage: Why High-Performance Work Systems Pay off. Cornell University Press: Ithaca, NY, USA.

[14] Phan, Q.P.T., Pham, T.N., Nguyen, L.H.L., 2020. How to drive brand engagement and EWOM intention in social commerce: A competitive strategy for the emerging market. Journal of Competitiveness. 12, 136–155.

[15] Tahir, A.H., Umer, M., Nauman, S., et al., 2024. Sustainable Development Goals and green human resource management: A comprehensive review of environmental performance. Journal of Environmental Management. 370, 122495.

[16] Cabral, C., Jabbour, C.J.C., 2020. Understanding the human side of green hospitality management. International Journal of Hospitality Management. 88, 102389.

[17] Wang, K.-H., Wang, Z.-S., Yunis, M., et al., 2023. Spillovers and connectedness among climate policy uncertainty, energy, green bond and carbon markets: A global perspective. Energy Economics. 128, 107170. DOI: https://doi.org/10.1016/j.eneco.2023.107170

[18] Hameed, Z., Naeem, R.M., Hassan, M., et al., 2021. How GHRM is related to GC? A moderated mediation model of green transformational leadership and green perceived organizational support. International Journal of Manpower. 43(3), 595–613. DOI: https://doi.org/10.1108/IJM-05-2020-0244

[19] Farooq, R., Zhang, Z., Talwar, S., et al., 2022. Do green human resource management and self-efficacy facilitate GC? A study of luxury hotels and resorts. Journal of Sustainable Tourism. 30(4), 824–845.

[20] Joshi, G., Dhar, R.L., 2020. Green training in enhancing GC via green dynamic capabilities in the Indian handicraft sector: The moderating effect of resource commitment. Journal of Cleaner Production. 267, 121948.

[21] Okumus, F., Köseoglu, M.A., Chan, E., et al., 2019. How do hotel employees' environmental attitudes and intentions to implement green practices relate to their ecological behavior? Journal of Hospitality and Tourism Management. 39, 193–200.
[22] Darvishmotevali, M., Altinay, L., 2022. Green HRM, environmental awareness and green behaviors: The moderating role of servant leadership. Tourism Management. 88, 104401.
[23] Dumont, J., Shen, J., Deng, X., 2017. Effects of green HRM practices on employee workplace green behaviour: The role of psychological green climate and employee green values. Human Resource Management. 56(4), 613–627.
[24] Shah, K.J., Pan, S.-Y., Lee, I., et al., 2021. Green transportation for sustainability: Review of current barriers, strategies, and innovative technologies. Journal of Cleaner Production. 326, 129392.
[25] Jabbour, C.J.C., Santos, F.C.A., Nagano, M.S., 2010. Contributions of HRM throughout the stages of environmental management: Methodological triangulation applied to companies in Brazil. The International Journal of Human Resource Management. 21(7), 1049–1089.
[26] Jamil, S., Zaman, S.I., Kayikci, Y., et al., 2023. The role of green recruitment on organizational sustainability performance: A study within the context of green human resource management. Sustainability. 15(21), 15567. DOI: https://doi.org/10.3390/su152115567
[27] Acciaro, M., Ghiara, H., Cusano, M.I., 2014. Energy management in seaports: A new role for port authorities. Energy Policy. 71, 4–12.
[28] Wagner, M., 2013. 'Green' human resource benefits: Do they matter as determinants of environmental management system implementation? Journal of Business Ethics. 114(3), 443–456.
[29] Masri, H.A., Jaaron, A.A.M., 2017. Assessing green human resources management practices in Palestinian manufacturing context: An empirical study. Journal of Cleaner Production. 143, 474–489.
[30] Amabile, T.M., 1983. The social psychology of creativity: A componential conceptualization. Journal of Personality and Social Psychology. 45(2), 357–376.
[31] Chen, Y.-S., Chang, C.-H., 2013. The determinants of green product innovation performance: Green dynamic capabilities, green transformational leadership, and GC. Journal of Business Ethics. 116(1), 107–119.
[32] Chen, S., Jiang, W., Li, X., et al., 2021. Effect of employees' perceived green HRM on their workplace green behaviors in oil and mining industries: Based on cognitive-affective system theory. International Journal of Environmental Research and Public Health. 18(8), 4056. DOI: https://doi.org/10.3390/ijerph18084056
[33] Song, W., Yu, H., Xu, H., 2021. Effects of green human resource management and managerial environmental concern on green innovation. European Journal of Innovation Management. 24(3), 951–967.
[34] Cesário, F.J.S., Sabino, A., Moreira, A., et al., 2022. Green human resources practices and person-organization fit: The moderating role of the personal environmental commitment. Emerging Science Journal. 6(5), 938–951.
[35] Naya, P.T., 2022. The Era of Inclusivity: Employees Driving Green Human Resource Management toward Sustainable Prosperity. UCL Institute for Global Prosperity: London, UK.
[36] Fang, L., Shi, S., Gao, J., et al., 2022. The mediating role of green innovation and green culture in the relationship between green human resource management and environmental performance. PLoS One. 17(9), e0274820. DOI: https://doi.org/10.1371/journal.pone.0274820
[37] Munawar, S., Yousaf, D.H.Q., Ahmed, M., et al., 2023. Effects of green human resource management on green innovation through green human capital, environmental knowledge, and managerial environmental concern. Journal of Hospitality and Tourism Management. 52, 141–150.
[38] Karatepe, O.M., Dahleez, K., Jaffal, T., et al., 2023. Test of a sequential mediation model of green management innovation. The Service Industries Journal. 43(5–6), 312–335. DOI: https://doi.org/10.1080/02642069.2022.2164274
[39] Eisenberger, R., Huntington, R., Hutchison, S., et al., 1986. Perceived organizational support. Journal of Applied Psychology. 71(3), 500–507.
[40] Huelgas, S.M., Arellano, V.A., 2021. Green transformational leadership, green human resource management, and green innovation: Key to environmental performance of selected port management offices of Philippine Ports Authority. IOER International Multidisciplinary Research Journal. 3(3), 48–58.
[41] Rizvi, Y.S., Garg, R., 2022. Environmental sustain-

ability performance: A study of the role of green human resource management and other green internal intellectual capital components. International Journal of Business and Systems Research. 16(1), 65–105.

[42] Raza, S.A., Khan, K.A., 2022. Impact of green human resource practices on hotel environmental performance: The moderating effect of environmental knowledge and individual green values. International Journal of Contemporary Hospitality Management. 34(6), 2154–2175.

[43] Nisar, Q.A., Haider, S., Ali, F., et al., 2021. Green human resource management practices and environmental performance in Malaysian green hotels: The role of green intellectual capital and pro-environmental behavior. Journal of Cleaner Production. 311, 127504. DOI: https://doi.org/10.1016/j.jclepro.2021.127504

[44] Gill, A.A., Ahmad, B., Kazmi, S., 2021. The effect of green human resource management on environmental performance: The mediating role of employee eco-friendly behavior. Management Science Letters. 11, 1725–1736.

[45] Shah, N., Soomro, B.A., 2023. Effects of green human resource management practices on green innovation and behavior. Management Decision. 61(1), 290–312. DOI: https://doi.org/10.1108/MD-07-2021-0869

[46] Ababneh, O.M.A., 2021. How do green HRM practices affect employees' green behaviors? The role of employee engagement and personality attributes. Journal of Environmental Planning and Management. 64(7), 1204–1226.

[47] Podsakoff, P., MacKenzie, S.B., Lee, Y.J., et al., 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology. 88(5), 879–903.

[48] Lindell, M.K., Whitney, D.J., 2001. Accounting for common method variance in cross-sectional research designs. Journal of Applied Psychology. 86(1), 114–121. DOI: https://doi.org/10.1037/0021-9010.86.1.114

[49] Williams, L.J., Hartman, N., Cavazotte, F., 2010. Method Variance and Marker Variables: A Review and Comprehensive CFA Marker Technique. Organizational Research Methods. 13(3), 477–514.DOI: https://doi.org/10.1177/1094428110366036

[50] Mousa, S.K., Othman, M., 2020. The impact of green human resource management practices on sustainable performance in healthcare organisations: A conceptual framework. Journal of Cleaner Production. 243, 118595.

[51] Kalyar, M.N., Ali, F., Shafique, I., 2021. Green mindfulness and GC nexus in the hospitality industry: Examining the effects of green process engagement and CSR. International Journal of Contemporary Hospitality Management. 33(8), 2653–2675.

[52] Zhao, D., Bao, T., Cullinane, K., et al., 2021. Green port performance evaluation under uncertainty: A multiple attribute group decision analysis. International Journal of Shipping and Transport Logistics. 13(1/2), 130–155. DOI: https://doi.org/10.1504/IJSTL.2021.112918

[53] Kline, R.B., 2016. Principles and Practice of Structural Equation Modeling. The Guilford Press: New York, NY, USA.

[54] Bucak, U., 2016. Green Performance Criteria and Sustainable Port Concept: A Comparative Analysis [Master's Thesis]. Dokuz Eylül Üniversitesi: İzmir, Turkey.

[55] Hoyle, R.H. (Ed.), 1995. The structural equation modeling approach: Basic concepts and fundamental issues. In Structural Equation Modeling: Concepts, Issues, and Applications. Sage Publications, Inc.: Thousand Oaks, CA, USA. pp. 1–15.

[56] Teo, T., Tsai, L.T., Yang, C.-C., 2013. Applying structural equation modeling (SEM) in educational research: An introduction. In: Khine, M.S. (Ed). Application of Structural Equation Modeling in Educational Research and Practice. SensePublishers: Rotterdam, Netherlands. pp. 3–21. DOI: https://doi.org/10.1007/978-94-6209-332-4

[57] Raykov, T., Marcoulides, G.A., 2006. A First Course in Structural Equation Modeling, 2nd ed. Routledge: New York, NY, USA.

[58] Bollen, K.A., 1989. Structural Equations with Latent Variables. John Wiley & Sons: New York, NY, USA.

[59] MacCallum, R.C., Austin, J.T., 2000. Applications of structural equation modelling in psychological research. Psychological Bulletin. 51, 201–226.

[60] Nye, C.D., 2023. Reviewer resources: Confirmatory factor analysis. Organizational Research Methods. 26(4), 608–628.

[61] Dhaene, S., Rosseel, Y., 2024. An evaluation of non-iterative estimators in confirmatory factor analysis. Structural Equation Modeling. 31(1), 1–13. DOI: https://doi.org/10.1080/10705511.2

023.2187285

[62] Liu, J., Gao, X., Cao, Y., et al., 2022. Catalytic effect of green human resource practices on Sustainable Development Goals: Can individual values moderate an empirical validation in a developing economy? Sustainability. 14(21), 14502. DOI: https://doi.org/10.3390/su142114502

[63] Malik, M.S., Ali, K., Kausar, N., et al., 2021. Enhancing environmental performance through green HRM and green innovation: Examining the mediating role of green creativity and moderating role of green shared vision. Pakistan Journal of Commerce and Social Sciences. 15(2), 265–285.

[64] Zhu, C.J., Cooper, B.K., Thomson, S.B., et al., 2013. Strategic integration of HRM and firm performance in a changing environment in China: The impact of organisational effectiveness as a mediator. The International Journal of Human Resource Management. 24(15), 2985–3001. DOI: https://doi.org/10.1080/09585192.2013.763845