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Dynamics Of Green Industry And Green Human Resource Management Implementation In Enhancing Employee Performance At PTPN I

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ABSTRACT

Growing environmental pressure has increased the need for plantation companies to integrate sustainability principles into operational and human resource practices. This study examines the effects of Green Industry (GI) and Green Human Resource Management (GHRM) on employee performance at PTPN I and evaluates which approach is more closely associated with employee-level outcomes. A quantitative associative design was employed. Primary data were collected through structured questionnaires from permanent employees selected using purposive sampling, with eligibility based on at least one year of service and involvement in activities related to GI and GHRM. The constructs were assessed using a Likert-scale instrument and analyzed using partial least squares structural equation modeling (PLS-SEM). The measurement model met the required reliability and convergent validity criteria, with outer loadings above 0.70, AVE values above 0.50, and composite reliability values above 0.70. The structural model showed that GI had a positive but statistically insignificant effect on employee performance (beta = 0.201; t = 1.362; p = 0.173), whereas GHRM had a positive and significant effect (beta = 0.568; t = 4.536; p < 0.001). The model explained 51.8% of the variance in employee performance. These findings indicate that sustainability policies generate stronger employee-level outcomes when they are embedded in recruitment, training, appraisal, and reward practices. The study contributes practical evidence for aligning green operational initiatives with strategic human resource management in plantation-sector organizations.

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Introduction

Environmental issues and global climate change remain major concerns worldwide. Both developed and developing countries continue to face serious challenges such as increasing greenhouse gas emissions, air pollution, and the rising frequency of environmental disasters. These conditions indicate that environmental degradation has reached an alarming level (Zubair & Khan, 2019). Such circumstances demand that the industrial sector become more proactive in applying environmentally friendly principles to support sustainable development. Failure to address these issues not only threatens ecosystems but also poses significant risks to human health, economic stability, and social welfare.

At the organizational level, the concepts of Green Industry and Green Human Resource Management (GHRM) have increasingly been adopted as part of long-term sustainability strategies. Green Industry emphasizes reducing environmental impacts through energy efficiency, waste management, and more responsible production processes. By incorporating sustainable practices into operations, companies can minimize resource consumption, reduce emissions, and promote cleaner production techniques. Meanwhile, GHRM supports environmental objectives from the human resources perspective through training programs, environmentally conscious recruitment, and reward systems that encourage employee behaviors aligned with sustainability principles. These approaches not only benefit the environment but also enhance employee morale and performance, as employees feel part of a larger and meaningful goal

(Rachmayani, 2015). Additionally, employees who are actively engaged in sustainability initiatives often develop a stronger sense of organizational commitment and personal responsibility, which can further reinforce positive behaviors within the workplace.

As a state-owned enterprise operating in the plantation sector, PTPN I provides a relevant case to examine the implementation of these approaches. Given its operational dependence on natural conditions, the application of Green Industry and GHRM in PTPN I is highly significant. The company's activities, which involve extensive land management, resource extraction, and production processes, have direct implications for environmental sustainability. However, in practice, several challenges remain, including low awareness of environmental issues among employees, organizational culture that does not fully support change, and internal policies that have yet to provide optimal support (Sashmitha, 2022). These challenges may hinder the full potential of sustainability programs and reduce their impact on employee performance and organizational outcomes.

Therefore, this study focuses on examining the implementation of Green Industry and GHRM at PTPN I and their relationship with employee performance. Specifically, the study analyzes the role of internal policies, the organizational cultural response to change, and employee participation in environmentally friendly initiatives. By identifying both structural and behavioral barriers, this study provides a comprehensive understanding of the effectiveness of these strategies. Furthermore, the research aims to highlight best practices that can enhance employee engagement and performance while ensuring that environmental sustainability becomes an integral part of organizational operations. Ultimately, the findings of this study are expected to contribute not only to academic literature but also to practical insights for companies seeking to balance operational efficiency with sustainable development goals.

Literature Review

Green Industry Theory

Green Industry Theory emphasizes energy efficiency, sustainable use of resources, and the reduction of waste and emissions in production processes. This approach aims to create environmentally friendly production systems without reducing organizational productivity. Its implementation has been shown to improve operational efficiency and provide a healthier and more organized work environment, which in turn contributes to higher employee satisfaction (Jubaidah et al., 2024).

Green Human Resource Management (GHRM) Theory

GHRM is a human resource management concept that integrates environmental sustainability objectives into all HR practices, including recruitment, training, performance appraisal, and reward systems. The adoption of GHRM enhances employee involvement, commitment, and performance because employees perceive their work as more meaningful and aligned with evolving ecological and social values (Wibowo & Yulianto, 2022).

Performance Theory

Performance Theory explains that individual performance results from the interaction of ability, motivation, and opportunity. Optimal performance is achieved when employees possess sufficient competence, are supported by a conducive work system, and are motivated by organizational goals. Environment-oriented organizational policies contribute to shaping positive work behaviors, which directly affect employee productivity (Ramadhani & Prasetyo, 2023).

Environmental Awareness Theory

This theory highlights that an individual's level of environmental awareness influences their workplace behavior. Employees with high environmental awareness tend to voluntarily demonstrate pro-environmental behavior and are more receptive to environment-based policies. Environmental awareness also acts as a psychological factor moderating the relationship between GHRM practices and both employee behavior and performance (Lestari & Anggraini, 2022).

Method

This study employed an associative quantitative research design to examine the effects of Green Industry (GI) and Green Human Resource Management (GHRM) on employee performance at PTPN I.

Primary data were collected through a survey using structured questionnaires distributed to permanent employees selected through purposive sampling. Eligible respondents had at least one year of service and were involved in activities related to the implementation of GI and GHRM.

The questionnaire was developed from indicators representing each research variable, and responses were measured using a Likert scale. The data were analyzed using partial least squares structural equation modeling (PLS-SEM), consistent with the measurement-model and structural-model procedures reported in the results. The analysis assessed indicator reliability, convergent validity, construct reliability, effect size, coefficient of determination, and the significance and direction of the structural relationships through bootstrapping.

Results and Discussion

Measurement Model Assessment

This study employs a measurement model assessment, also known as outer model analysis, which aims to ensure that the measurement instruments used meet the required validity and reliability criteria. This process identifies the relationships between latent variables and their corresponding indicators. The results of the outer loading test for the Lower Order Construct (LOC) in this study can be seen in Figure 1.1

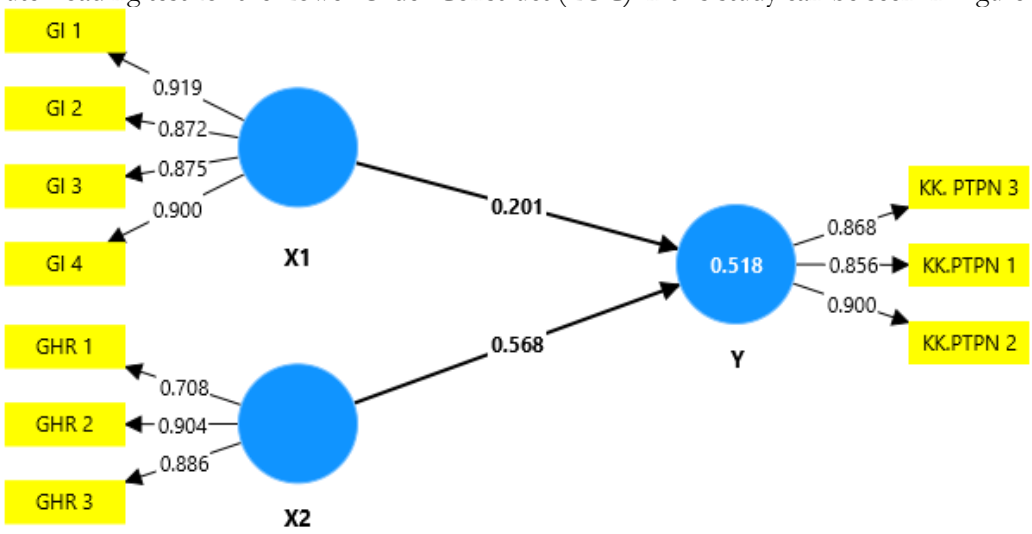


Figure 1. Measurement Model Assessment (Outer Model)

Source: Processed SmartPLS output, 2025.

The figure illustrates the results of the outer model analysis for the Lower Order Constructs (LOCs). The construct X1 is measured by four indicators (GI1-GI4) with loading values ranging from 0.872 to 0.919, all exceeding the acceptable threshold of 0.70, indicating strong indicator reliability. The construct X2 is measured by three indicators (GHR1-GHR3) with loadings between 0.708 and 0.904, which also demonstrate good reliability. The dependent construct Y is measured by three indicators (KK.PTPN1–KK.PTPN3) with loadings between 0.856 and 0.900, confirming convergent validity. The structural paths show that X1 has a positive effect on Y with a coefficient of 0.201, while X2 has a stronger positive effect on Y with a coefficient of 0.568. The coefficient of determination ($R^2 = 0.518$) indicates that approximately 51.8% of the variance in Y can be explained by X1 and X2. Overall, the model demonstrates good measurement reliability and structural validity.

Convergent Validity Test

The convergent validity test was conducted to ensure that each indicator accurately represents its respective construct. The outer loading values of all items under Green Industry, Green Human Resource Management, and Employee Performance at PTPN I were above 0.7, with AVE values exceeding 0.5. These results confirm that all indicators meet the criteria for convergent validity and are suitable for further analysis.

Table 1. Outer Loadings and Average Variance Extracted (AVE)

Variable	Measurement Item	Outer Loading	AVE
Green Industry	GI1	0.919	0.795
Green Industry	GI2	0.872	
Green Industry	GI3	0.875	
Green Industry	GI4	0.900	
Green Human Resource Management	GHRM1	0.708	0.701
Green Human Resource Management	GHRM2	0.904	
Green Human Resource Management	GHRM3	0.886	
Employee Performance at PTPN I	EP1	0.856	0.765
Employee Performance at PTPN I	EP2	0.900	
Employee Performance at PTPN I	EP3	0.868	

Source: Processed SmartPLS output, 2025.

Reliability Test

Reliability was evaluated using Cronbach's Alpha and Composite Reliability. All variables achieved Cronbach's Alpha values above 0.6 and Composite Reliability above 0.7: Green Industry (α = 0.915; CR = 0.939), Green Human Resource Management (α = 0.789; CR = 0.874), and Employee Performance (α = 0.847; CR = 0.907). Therefore, all constructs are considered reliable and consistent.

Table 2. Cronbach's Alpha and Composite Reliability

Variable	Cronbach's Alpha	Composite Reliability
Green Industry	0.915	0.939
Green Human Resource Management	0.789	0.874
Employee Performance at PTPN I	0.847	0.907

Source: Processed SmartPLS output, 2025.

Effect Size (F-Square)

The effect size results revealed that Green Industry had an f^2 value of 0.045 (small effect), while Green Human Resource Management had an f^2 value of 0.360 (large effect). This means that GHRM exerts a stronger influence on employee performance compared to Green Industry.

Table 3. Effect Size (f^2) on Employee Performance

Predictor	f^2 on Employee Performance
Green Industry	0.045
Green Human Resource Management	0.360

Hypothesis Testing

Hypothesis testing in PLS-SEM was conducted using a bootstrapping procedure. The significance and direction of the structural relationships were evaluated from the t-statistics, p-values, and path coefficients. Positive path coefficients indicate relationships in the same direction, whereas negative coefficients indicate inverse relationships.

Table 4. Bootstrapping Results

Path	Original Sample	Sample Mean	SD	t-statistic	p-value
GI -> Employee Performance	0.201	0.204	0.148	1.362	0.173
GHRM -> Employee Performance	0.568	0.568	0.125	4.536	0.000

Source: Processed SmartPLS output, 2025.

Based on Table 1.4, the results of the hypothesis testing using SEM with the Smart-PLS approach are as follows. The first hypothesis (H1) examines the effect of Green Industry (GI) on Employee Performance at PTPN I I, showing a t-statistic value of 1.362 (< 1.96), and a p-value of 0.173, and a path coefficient of 0.201. These results indicate that Green Industry does not have a significant effect on employee performance at PTPN I. The second hypothesis (H2) analyzes the effect of Green Human Resource Management (GHRM) on Employee Performance at PTPN I I, with a t-statistic value of 4.536 (> 1.96), and a p-value of 0.000, and a path coefficient of 0.568. This demonstrates that Green Human Resource has a positive and significant effect on employee performance at PTPN I.

The Effect of Green Industry on Employee Performance at PTPN I

The results indicate that Green Industry (GI) has no significant effect on employee performance at PTPN I ($t = 1.362$; $p = 0.173$). Although the path coefficient shows a positive direction (0.201), the effect is not statistically strong. This can be explained by the fact that GI implementation focuses more on organizational operations and infrastructure, such as the use of environmentally friendly technology or energy efficiency, which do not directly influence individual behavior or work motivation. Previous studies also emphasize that environmental policies often have a significant impact at the macro-organizational level but do not automatically improve employee performance without mediating factors such as training, organizational culture, or incentives (Zacher & Rudolph, 2023).

In addition, the implementation of GI in plantation companies such as PTPN I tends to be administrative or merely regulatory compliance, so employees do not feel the direct benefits of these programs. This finding is consistent with Lopes et al. (2023), who explained that environmental programs that are poorly communicated or symbolic in nature reduce their impact on individual behavior and performance. Moreover, the lack of practical engagement or participatory initiatives means employees may perceive GI as a top-down mandate rather than a meaningful part of their daily work. This perception can limit intrinsic motivation, as workers may not associate sustainability practices with personal or professional growth.

Therefore, although GI is oriented toward sustainability, without employee involvement through training, value reinforcement, and reward systems, its influence on personal performance remains weak and insignificant. To enhance the effectiveness of GI on employee outcomes, organizations may need to implement strategies that actively involve staff in environmental initiatives, provide continuous feedback, and link sustainability goals with performance recognition. By fostering a culture that emphasizes both environmental responsibility and individual contribution, companies like PTPN I could potentially convert GI efforts into tangible improvements in employee performance, satisfaction, and commitment.

The Effect of Green Human Resource Management on Employee Performance at PTPN I

In contrast to GI, the results show that Green Human Resource Management (GHR) has a positive and significant effect on employee performance at PTPN I ($t = 4.536$; $p = 0.000$; path coefficient = 0.568). This indicates that GHRM practices such as environmentally oriented recruitment, green training, performance appraisals that include sustainability indicators, and incentives for environmentally friendly

behavior can enhance employee motivation, competence, and commitment to the organization. According to AlKetbi (2024), GHR serves as a strong signal that the company places sustainability as a strategic priority, thereby encouraging employees to deliver better performance in line with the company's values and objectives.

This finding is also in line with Song et al. (2023), who demonstrated that GHRM significantly improves employees' green innovative behavior through the establishment of a green psychological climate within organizations. With a supportive psychological climate, employees are not only more skilled in performing their tasks but also more creative in proposing environmentally friendly innovations, which ultimately enhances overall performance. Furthermore, GHRM practices foster a sense of ownership and personal responsibility toward environmental initiatives, as employees perceive that their contributions are valued and recognized. This reinforcement of pro-environmental behavior can create a positive feedback loop, where motivated employees are more likely to participate in sustainability programs and, in turn, achieve higher performance outcomes.

In addition, integrating GHRM into organizational processes ensures that sustainability becomes part of the organizational culture rather than a peripheral activity. For instance, continuous green training helps employees develop the necessary knowledge and skills to apply sustainable practices in daily operations, while performance appraisals and reward systems link individual achievements to organizational sustainability goals. By doing so, employees align their personal objectives with the company's strategic vision, enhancing both individual and organizational performance simultaneously. Therefore, GHRM proves to be an effective strategic instrument for PTPN I to improve employee performance while supporting its sustainability goals, highlighting the critical role of human resource practices in bridging organizational policies with tangible employee behavior and outcomes.

Conclusion

This study examined the effects of Green Industry (GI) and Green Human Resource Management (GHRM) on employee performance at PTPN I using PLS-SEM. The measurement model satisfied the reported validity and reliability criteria. GHRM had a positive and significant effect on employee performance ($t = 4.536$; $p = 0.000$; beta = 0.568), while GI showed a positive but statistically insignificant effect ($t = 1.362$; $p = 0.173$; beta = 0.201). These findings indicate that green-oriented human resource practices are more directly associated with employee-level performance than operational green-industry initiatives when the latter are not strongly connected to employee involvement.

The study contributes practical evidence that sustainability strategies should connect operational environmental policies with recruitment, training, performance appraisal, employee participation, and reward systems. For PTPN I and comparable plantation-sector organizations, strengthening this integration may help translate environmental commitments into measurable behavioral and performance outcomes. The study is limited by its focus on a single organizational context and the variables included in the model. Future research should test the relationships across organizations and sectors and examine mediating or moderating mechanisms such as environmental awareness, green organizational culture, employee engagement, and perceived organizational support.

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Author Contributions Statement

All authors contributed to the conception, implementation, analysis, and preparation of the study. All authors reviewed and approved the final version of the manuscript. The specific contribution allocation should be confirmed by the authors before final submission.

AI Usage Statement

Generative AI tools were used solely to support English-language editing, grammar checking, clarity, readability, and document formatting. AI tools were not used to generate research data, conduct the

statistical analysis, or determine the substantive scholarly conclusions. The authors retain full responsibility for the originality, accuracy, and academic integrity of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest related to this study. This declaration should be confirmed by all authors before submission.

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