

The Effect of Green Human Resource Management on Environmental Performance Through the Serial Mediation of Green Organizational Culture and Employee Environmental Commitment

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ABSTRACT

Environmental performance in the national railway transportation sector remains a pressing concern, as green human resource policy has not consistently translated into measurable environmental outcomes. This study examines the effect of Green Human Resource Management (Green HRM) on Environmental Performance, both directly and through the serial mediation of Green Organizational Culture and Employee Environmental Commitment, among permanent employees of PT Kereta Api Indonesia (Persero) Operational Area 9 Jember. An explanatory quantitative design was employed, with data collected from 172 permanent employees selected through Proportionate Quota Sampling combined with Accidental Sampling. Data were gathered using a Likert-scale questionnaire and analyzed with Partial Least Square Structural Equation Modeling (PLS-SEM) using SmartPLS 4.0. The results show that Green HRM has a significant positive effect on Green Organizational Culture ($\beta = 0.710$) and Employee Environmental Commitment ($\beta = 0.170$), while its direct effect on Environmental Performance is not significant ($p = 0.120$). Both Green Organizational Culture and Employee Environmental Commitment significantly and positively affect Environmental Performance. Single mediation through either variable is not significant, whereas the serial mediation path from Green HRM through Green Organizational Culture and Employee Environmental Commitment to Environmental Performance is significant ($\beta = 0.203$; $p = 0.009$). These findings indicate that environmental performance improves not from a direct effect of green HR policy, but through a gradual process in which organizational culture is formed first and subsequently shapes individual environmental commitment. Organizations in similarly bureaucratic, operationally centralized sectors may need to prioritize culture-building and commitment-formation programs alongside formal green HR policy to achieve measurable environmental gains.

Keywords: Green Human Resource Management, Green Organizational Culture, Employee Environmental Commitment, Environmental Performance, serial mediation

INTRODUCTION

Rising carbon emissions from industrial sectors remain one of the leading drivers of global environmental problems. Data from the International Energy Agency show that Indonesia's CO₂ emissions from fuel combustion approached 800 million tons in 2023, ranking Indonesia 7th globally and 4th in Asia among the largest emitters, with the transportation sector contributing 22.3% of total national emissions [1]. This condition has driven the transformation of the public transportation sector, including the role of PT Kereta Api Indonesia (Persero) as the national railway service provider in supporting emission reduction targets.

PT KAI's sustainability commitment is reflected in the KAI Peduli Lingkungan (KAI-Pling) program, which encourages employee involvement in waste management, tree planting, and energy efficiency.

Environmental performance data from Operational Area 9 Jember for the 2022 to 2024 period, however, reveal an unfavorable trend. PLN electricity consumption rose from 1,080,070 kWh to 1,542,597 kWh, biosolar fuel consumption increased from 7,610 kL to 8,633 kL, and tree planting realization was recorded at only 395 trees in 2024. Preliminary interviews with the Assistant HR Manager of Operational Area 9 Jember further indicate that the integration of environmental values into the HR system remains limited: environmental criteria have not yet been incorporated into recruitment, environmental indicators are absent from KPIs, and no reward mechanism based on environmental achievement has been established. Prior studies show inconsistent findings regarding the effect of Green Human Resource Management (Green HRM) on Environmental Performance. Most studies confirm a significant positive effect [2][3][4], whereas one study found the opposite [5]. Previous research has generally tested Green Organizational Culture and Employee Environmental Commitment as single mediators separately, and most studies have focused on the manufacturing, hospitality, and banking sectors, leaving a research gap in the rail-based transportation sector with a serial mediation model.

This study uses the Theory of Planned Behavior [6] as the grand theory, in which Green HRM shapes employees' attitude toward behavior, Green Organizational Culture represents subjective norms, and Employee Environmental Commitment represents perceived behavioral control regarding pro-environmental behavior. This construct-level mapping follows prior applications of the Theory of Planned Behavior to workplace pro-environmental contexts, in which organizational HR practices function as antecedents of attitude formation, shared cultural norms serve as a proxy for subjective norms, and individual-level commitment reflects perceived capability to enact the target behavior [16]. Social Learning Theory [7] serves as the supporting theory to explain the serial mediation sequence, in which employees learn pro-environmental behavior by observing and imitating collective norms before internalizing them as personal commitment. Based on this gap, the present study aims to analyze the effect of Green HRM on Environmental Performance, both directly and through the serial mediation of Green Organizational Culture and Employee Environmental Commitment, among permanent employees of PT KAI Operational Area 9 Jember, with the following nine hypotheses proposed: H1, Green HRM affects Green Organizational Culture; H2, Green Organizational Culture affects Environmental Performance; H3, Green HRM affects Employee Environmental Commitment; H4, Employee Environmental Commitment affects Environmental Performance; H5, Green HRM affects Environmental Performance directly; H6, Green Organizational Culture affects Employee Environmental Commitment; H7, Green Organizational Culture mediates the effect of Green HRM on Environmental Performance; H8, Employee Environmental Commitment mediates the effect of Green HRM on Environmental Performance; and H9, Green Organizational Culture and Employee Environmental Commitment serially mediate the effect of Green HRM on Environmental Performance.

CONCEPTUAL FRAMEWORK

Figure 1 illustrates the hypothesized relationships among the four constructs, showing the serial mediation path through which Green HRM is expected to affect Environmental Performance.

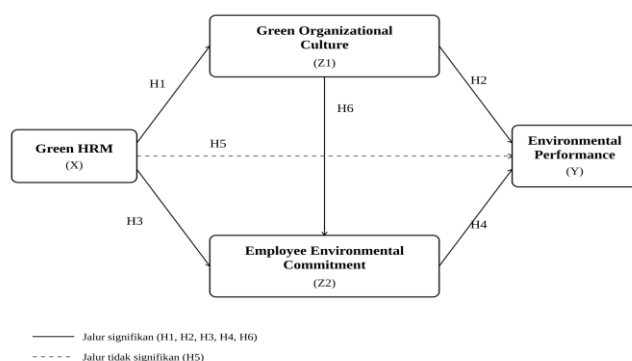


Figure 1. Conceptual framework of the serial mediation model

METHODOLOGY

This study employs an explanatory research design with a quantitative approach. The population comprises all permanent employees of PT KAI Operational Area 9 Jember, totaling 946 people distributed across 16 divisions. The sample size was determined at 200 based on the criteria proposed by Hair et al. [8] for Partial Least Squares Structural Equation Modeling (PLS-SEM), which recommends a ratio of 5 to 10 respondents per indicator across 29 model indicators. A total of 172 respondents were ultimately obtained through Proportionate Quota Sampling combined with Accidental Sampling during the period of 27 July to 27 August 2026.

Primary data were collected through an online questionnaire distributed via Google Form using a 1 to 5 Likert scale. The research variables include Green HRM (X, 10 indicators adapted from [9][10]), Green Organizational Culture (Z1, 5 indicators adapted from [11]), Employee Environmental Commitment (Z2, 7 indicators adapted from [12]), and Environmental Performance (Y, 7 indicators adapted from [13]). Data were analyzed using PLS-SEM with SmartPLS 4.0, covering outer model evaluation (convergent validity, discriminant validity assessed through the Fornell-Larcker criterion, cross-loadings, and the Heterotrait-Monotrait ratio (HTMT), composite reliability, and Cronbach's alpha) as well as inner model evaluation (R², f², Q²predict, and hypothesis testing for both direct and indirect effects through bootstrapping, with a significance threshold of $p < 0.05$ and t-statistic above 1.979). Common method bias arising from the single-source, self-reported, single-time-point survey design was additionally assessed using Harman's single-factor test (unrotated exploratory factor analysis), applied to both the full set of originally measured items and the final retained indicator set.

RESULTS

Respondent Characteristics

Respondents were predominantly male (97.1%), aged 35 to 44 years (50.6%), with a senior-high-school or vocational education background (83.1%) and 16 to 20 years of tenure (44.8%), consistent with the operational and technical nature of the workforce.

Outer and Inner Model Evaluation

After eliminating seven indicators with loading factors below 0.70, all remaining indicators showed outer loadings above 0.70. Average Variance Extracted (AVE) values for all variables exceeded 0.50 (Green HRM = 0.626; Green Organizational Culture = 0.700; Employee Environmental Commitment = 0.781; Environmental Performance = 0.676), satisfying convergent validity. Discriminant validity was confirmed through the Fornell-Larcker criterion and cross-loadings, and further supported by the Heterotrait-Monotrait ratio (HTMT), with all inter-construct HTMT values remaining below the conservative threshold of 0.90, the highest value being 0.835 between Green Organizational Culture and Employee Environmental Commitment. Composite reliability and Cronbach's alpha for all variables exceeded the required thresholds of 0.70 and 0.60 respectively. To evaluate the risk of common method bias, Harman's single-factor test was conducted using unrotated exploratory factor analysis. When applied to the full set of 29 items as originally measured, the first unrotated factor explained 43.8% of the total variance, below the 50% threshold conventionally used to indicate that common method bias is unlikely to be a serious concern. However, when the same procedure was repeated using only the 22 indicators retained in the final measurement model, the first factor explained 51.8% of the variance, marginally exceeding the 50% threshold. Because this result is sensitive to which indicator set is used, common method bias cannot be fully ruled out and is treated as an acknowledged limitation of the study rather than as evidence that it is absent; nevertheless, the observed pattern of non-significant direct and single-mediation paths (H5, H7, H8) alongside a significant serial mediation path (H9) is not what would be expected if the results were primarily an artifact of common method variance, which offers some indirect reassurance.

R2 values indicate that Green HRM and Green Organizational Culture together explain 59.6% of the variance in Employee Environmental Commitment and 59.6% of the variance in Environmental Performance, while Green HRM alone explains 50.4% of the variance in Green Organizational Culture. The largest effect size was found for the path from Green HRM to Green Organizational Culture ($f^2 = 1.017$, large category), whereas the direct path from Green HRM to Environmental Performance showed a small effect size ($f^2 = 0.023$). Q2predict values for all endogenous variables were above zero, indicating adequate predictive relevance.

Hypothesis Testing

Bootstrapping results show that H1 is supported ($\beta = 0.710$; $t = 13.842$; $p = 0.000$), H2 is supported ($\beta = 0.262$; $t = 1.980$; $p = 0.048$), H3 is supported ($\beta = 0.170$; $t = 2.050$; $p = 0.040$), H4 is supported ($\beta = 0.446$; $t = 2.879$; $p = 0.004$), H6 is supported ($\beta = 0.642$; $t = 8.853$; $p = 0.000$), and H9 is supported ($\beta = 0.203$; $t = 2.611$; $p = 0.009$). H5 is not supported ($\beta = 0.140$; $t = 1.553$; $p = 0.120$), H7 is not supported ($\beta = 0.186$; $t = 1.887$; $p = 0.059$), and H8 is not supported ($\beta = 0.076$; $t = 1.573$; $p = 0.116$). It should be noted that the t-statistic obtained for H2 ($t = 1.980$) lies only marginally above the critical value of 1.979 used in this study; given how close this result sits to the significance threshold, it is interpreted with greater caution than paths supported by clearly larger t-statistics and should not be read as equally decisive evidence.

DISCUSSION

The pattern of results shows that Green HRM strongly shapes Green Organizational Culture, consistent with the Theory of Planned Behavior, which positions HR policy as a driver of attitude and subjective norms. The direct effect of Green HRM on Environmental Performance, however, is not significant, indicating that green HR policies do not automatically translate into changed employee behavior without first passing through the formation of organizational culture and individual commitment. This pattern is consistent with Social Learning Theory.

The significant serial mediation path confirms that improving Environmental Performance at PT KAI Operational Area 9 Jember requires a gradual process in which Green HRM first forms Green Organizational Culture, which in turn fosters Employee Environmental Commitment, ultimately enhancing environmental performance. This finding is consistent with recent evidence of serial mediation patterns in green HRM research [14], but it differs from most prior studies that found a significant direct effect of Green HRM [3][15]. This discrepancy can be explained by the early stage of Green HRM implementation at Operational Area 9 Jember, where environmental indicators have not yet been integrated into KPIs and no environmental reward mechanism has been established.

The pattern in which the serial mediation path (H9) is significant while the two single-mediation paths (H7 and H8) are not is theoretically noteworthy and warrants closer interpretation rather than a one-line confirmation. A plausible explanation is a suppression-type mechanism, in which each single mediator on its own captures only part of the causal sequence linking Green HRM to Environmental Performance: Green Organizational Culture alone reflects a shift in shared norms that has not yet been translated into individual commitment, while Employee Environmental Commitment alone captures individual willingness without a supporting cultural foundation, so that each single pathway understates the true indirect effect. It is only when the two mediators operate in sequence, culture shaping commitment which in turn shapes behavior, that the full transmission mechanism from HR policy to individual pro-environmental action is captured, consistent with the sequential, observation-then-internalization logic of Social Learning Theory [7] and with recent evidence that serial rather than single mediation better explains how green HR policy translates into environmental outcomes [14]. This result suggests that in a bureaucratic, technically oriented organization such as PT KAI, environmental commitment is unlikely to emerge directly from organizational culture cues or from HR policy in isolation, but only after the two operate jointly and in the correct sequence.

LIMITATIONS

This study is subject to several limitations that should be considered when interpreting the findings. First, the final sample of 172 respondents falls below the pre-determined target of 200 and sits at the lower bound of the 5-to-10-respondents-per-indicator rule of thumb for the 29 indicators used, which may affect the stability of some parameter estimates. Second, respondents were obtained through non-probability sampling techniques (Proportionate Quota Sampling combined with Accidental Sampling), which limits the statistical generalizability of the findings to the broader employee population. Third, the study was conducted within a single organization and a single operational region (PT KAI Operational Area 9 Jember), so the findings may not generalize to other operational areas, other transportation operators, or other sectors. Fourth, the respondent profile was heavily skewed toward male employees (97.1%), reflecting the technical and operational nature of the workforce, which may limit the extent to which the findings reflect the experience of female employees. Fifth, Harman's single-factor test produced a result that depends on which indicator set is used: the first unrotated factor explained 43.8% of the variance when the full set of 29 originally measured items was used, but 51.8% when only the 22 indicators retained in the final model were used, marginally exceeding the conventional 50% threshold; common method bias can therefore not be fully ruled out. Finally, the cross-sectional design captures relationships at a single point in time and cannot establish the direction of causality implied by the hypothesized model; a longitudinal or mixed-methods design would allow the serial mediation mechanism to be examined as it unfolds over time.

CONCLUSION

Green HRM has a significant positive effect on Green Organizational Culture and Employee Environmental Commitment, and both variables each have a significant positive effect on Environmental Performance. Green HRM does not have a significant direct effect on Environmental Performance, and single mediation through either variable is not significant. Environmental Performance improves significantly only when Green HRM operates through the serial mediation of Green Organizational Culture followed by Employee Environmental Commitment. These findings confirm that green HR policies require a gradual internalization process, first through organizational culture and then through individual commitment, before producing a tangible impact on organizational environmental performance.

For PT KAI Operational Area 9 Jember, it is recommended that environmental indicators be integrated into the KPI system and recruitment process, that a reward mechanism based on environmental achievement be established, and that the KAI-Pling program be expanded to more work units. Future research is encouraged to extend the scope to other Operational Areas or to employ mixed methods to further explore the serial mediation mechanism in the public transportation sector.

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REFERENCES

1. International Energy Agency. (2023). World Energy Outlook 2023. Paris: OECD Publishing. <https://doi.org/10.1787/827374a6-en>
2. Aggarwal, P., & Agarwala, T. (2023). Relationship of green human resource management with environmental performance: Mediating effect of green organizational culture. *Benchmarking: An International Journal*, 30(7), 2351-2376. <https://doi.org/10.1108/BIJ-08-2021-0474>
3. Afzal, C. M., Khan, S. N., Baig, F. J., & Ashraf, M. U. (2023). Impact of green human resource management on environmental performance: The mediating role of green innovation and environmental strategy in Pakistan. *Review of Applied Management and Social Sciences*, 6(2), 227-242. <https://doi.org/10.47067/ramss.v6i2.311>

4. Abdullahi, U., Al-Amrani, K. A. D., Mohamed, A. M., Khalid, M. S., & Yahaya, H. D. (2024). Green human resource management and environmental performance: The mediating role of employee commitment and the contingent effect of organizational culture. *Journal of Management World*, 2024(4), 484-497. <https://doi.org/10.53935/jomw.v2024i4.439>
5. Pramudita, E. J., & Gunawan, A. W. (2023). Pengaruh green human resource management, green human capital dan green innovation terhadap environmental performance melalui green human capital dan green innovation pada PT Mitrakarya Cipta Gemilang. *Glosains: Jurnal Sains Global Indonesia*, 4(1), 21-40.
6. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
7. Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.
8. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM) (2nd ed.)*. Thousand Oaks, CA: SAGE Publications.
9. Jabbour, C. J. C. (2011). How green are HRM practices, organizational culture, learning and teamwork? A Brazilian study. *Industrial and Commercial Training*, 43(2), 98-105. <https://doi.org/10.1108/00197851111108926>
10. Tang, G., Chen, Y., Jiang, Y., Paillé, P., & Jia, J. (2018). Green human resource management practices: Scale development and validity. *Asia Pacific Journal of Human Resources*, 56(1), 31-55. <https://doi.org/10.1111/1744-7941.12147>
11. Pham, N. T., Tučková, Z., & Jabbour, C. J. C. (2019). Greening the hospitality industry: How do green human resource management practices influence organizational citizenship behavior in hotels? A mixed-methods study. *Tourism Management*, 72, 386-399. <https://doi.org/10.1016/j.tourman.2018.12.008>
12. Raineri, N., & Paillé, P. (2016). Linking corporate policy and supervisory support with environmental citizenship behaviors: The role of employee environmental beliefs and commitment. *Journal of Business Ethics*, 137(1), 129-148. <https://doi.org/10.1007/s10551-015-2548-x>
13. Paillé, P., Chen, Y., Boiral, O., & Jin, J. (2014). The impact of human resource management on environmental performance: An employee-level study. *Journal of Business Ethics*, 121(3), 451-466. <https://doi.org/10.1007/s10551-013-1732-0>
14. Aristizábal Murillo, J. C., & Marín-Idárraga, D. A. (2026). Linking green human resource management to green competitiveness: The role of organizational learning culture and employee environmental commitment. *Cleaner Production Letters*, 10, 100140. <https://doi.org/10.1016/j.clpl.2026.100140>
15. Roscoe, S., Subramanian, N., Jabbour, C. J. C., & Chong, T. (2019). Green human resource management and the enablers of green organisational culture: Enhancing a firm's environmental performance for sustainable development. *Business Strategy and the Environment*, 28(5), 737-749.
16. Khalid, B., Shahzad, K., Shafi, M. Q., & Paillé, P. (2022). Predicting required and voluntary employee green behavior using the theory of planned behavior. *Corporate Social Responsibility and Environmental Management*, 29(5), 1300-1314. <https://doi.org/10.1002/csr.2270>