Eco-Conscious HRM and Sustainable Work Systems for Environmental Performance: Evidence from Indonesian Manufacturing

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ABSTRACT

The intensification of global environmental challenges has compelled organizations to integrate sustainability into their strategic and operational domains. In this context, eco-conscious human resource management (HRM) and sustainable work systems have gained increasing attention as drivers of environmental performance. This study aims to examine the effects of eco-conscious HRM and sustainable work systems on corporate environmental performance in the manufacturing sector of West Java, Indonesia, with employee ecological awareness and sustainability culture as mediating variables. A quantitative research design was employed using a cross-sectional survey distributed to 300 respondents across five major industrial zones. Data were analyzed using structural equation modeling (SEM) with a two-step approach. Measurement validity and reliability were established through confirmatory factor analysis (CFA), while mediation effects were tested using bootstrapping procedures. The findings demonstrate that eco-conscious HRM exerts a significant effect on sustainability culture but does not directly influence employee ecological awareness. In contrast, sustainable work systems show stronger and more comprehensive impacts, directly and indirectly enhancing environmental performance through both mediating pathways. Notably, sustainability culture emerged as a more effective mediator compared to individual ecological awareness, underscoring the importance of cultural transformation in achieving sustainable organizational outcomes. This study contributes theoretically by integrating individual- and organizational-level perspectives into a unified model of sustainable HRM, while practically offering guidance for manufacturing firms to prioritize systemic and culture-centric interventions. The results highlight the complementary nature of HRM practices and sustainable work systems, with implications for advancing sustainable development goals in emerging economies.

1. INTRODUCTION

The intensification of global environmental challenges has triggered a fundamental transformation in contemporary business paradigms. Climate change, natural resource depletion, and mounting regulatory pressures have compelled organizations to embed sustainability into their operational strategies, no longer treating it as a peripheral responsibility but as a strategic imperative that determines long-term survival [1]. The sustainable development goals and rising societal expectations are increasingly pressuring firms to adopt innovative practices that align with broader sustainability objectives [2]. This transformation requires a holistic approach that engages all organizational dimensions, with human resource management (HRM) playing a pivotal role as an enabler of cultural and behavioral change.

Within this domain, Green Human Resource Management (GHRM) has emerged as a strategic approach that aligns conventional HRM practices such as recruitment, training, performance evaluation, and rewards with organizational environmental goals. GHRM is defined as 'the systematic and planned alignment of typical HRM practices with the organization's environmental goals' [3]. The concept of *eco-conscious HRM* advances this notion by fostering deeper ecological awareness among employees and embedding environmental responsibility into the organizational fabric. Green HRM consists not only of environmentally friendly HR practices but also of the preservation and utilization of knowledge capital [4]. Such practices include sustainable recruitment, environmental training, green performance appraisal, and incentive systems that encourage pro-environmental behaviors [5]. Yet, the effectiveness of sustainable HRM remains uncertain, with academic perspectives on its meaning and outcomes still fragmented [6].

Complementing HRM initiatives, sustainable work systems represent the organizational design and processes that integrate sustainability principles into day-to-day operations. Sustainable manufacturing involves embedding environmental considerations into strategic decision-making, thereby enhancing organizational capacity for sustainable operations [7]. Similarly, sustainable manufacturing is defined as the creation of products through economically sound

processes that minimize environmental harm while conserving resources [8]. In manufacturing contexts, these systems underpin the "triple bottom line" of profit, people, and planet [9], enabling firms to balance economic viability with social and environmental performance.

Two mediating factors, employee ecological consciousness and sustainability culture, are particularly salient in linking eco-conscious HRM and sustainable work systems to organizational environmental performance. Employee ecological consciousness represents a crucial mechanism translating HR practices into individual pro-environmental behaviors [10]. Beyond cognitive understanding, this consciousness involves emotional and behavioral commitment to sustainability goals, reinforced by organizational initiatives such as green training and performance management [11]. For this consciousness to evolve into consistent behaviors, systemic support is required, including a psychological green climate that shapes employee perceptions and actions [12].

At the organizational level, sustainability culture constitutes the shared values, norms, and assumptions that either enable or constrain environmental initiatives. Organizational culture is central to achieving corporate sustainability [13], while proactive cultures often go beyond regulatory compliance to drive meaningful sustainability transformations [14]. More recently, a sustainability culture model has been proposed that emphasizes normative foundations in values and assumptions as the cornerstone of long-term environmental performance [15].

The case of West Java, Indonesia, illustrates both the urgency and potential of these dynamics. As the largest manufacturing hub in the country, West Java hosts more than 8,200 medium and large-scale firms [16], with industrial clusters concentrated in Bekasi, Cikarang, and Karawang [17]. This high density of industrial activity exerts significant environmental pressure but simultaneously presents opportunities for large-scale implementation of sustainable practices. Manufacturing sectors such as textiles, automotive, and electronics, which dominate the region, require context-specific strategies that address operational complexity and competitive intensity while advancing sustainability goals [18].

Despite the rapid development of GHRM scholarship, several gaps remain. First, conceptual ambiguity persists regarding the scope and effectiveness of sustainable HRM [6]. Second, the mediating roles of employee ecological consciousness and sustainability culture have been underexplored, particularly within manufacturing contexts. Third, most prior studies are situated in developed economies, leaving a paucity of research in developing-country settings where institutional, cultural, and regulatory dynamics differ significantly [19]. Finally, the integration of eco-conscious HRM with sustainable work systems through dual mediation mechanisms has not been comprehensively modeled in existing literature [20].

These research gaps underscore the urgency of the present study. Heightened regulatory demands, evolving employee expectations, and the accelerated push toward Industry 4.0 collectively necessitate innovative approaches to HRM and organizational systems. Reports indicate that 80% of millennials and Gen Z employees in Asia prioritize sustainability and inclusivity in employment decisions [21], yet only 30% of firms in the region have adopted sustainable HRM policies [22]. Moreover, post-pandemic realities have amplified awareness of sustainability and resilience as central to business continuity [23]. Addressing these converging pressures, this study aims to develop and test an integrated model that examines the influence of eco-conscious HRM and sustainable work systems on environmental performance, mediated by employee ecological consciousness and sustainability culture, within the unique context of West Java's manufacturing sector.

Causal ordering between eco-conscious HRM and sustainability culture is theoretically anchored in organizational change and institutionalization arguments, where HRM systems (e.g., training, appraisal, rewards, and green leadership) act as formal mechanisms that socialize employees and gradually institutionalize shared sustainability values into organizational routines. Nevertheless, we acknowledge the possibility of reciprocal causality, in which a pre-existing sustainability-oriented culture may facilitate the adoption and effectiveness of eco-conscious HRM. Given the cross-sectional nature of this study, we position the directionality as theory-driven rather than temporal proof and therefore conduct robustness checks using alternative (reversed) structural specifications to assess whether the proposed ordering provides superior explanatory power.

Beyond the indirect mechanisms via employee ecological awareness and sustainability culture, we also specify direct paths from eco-conscious HRM and sustainable work systems to corporate environmental performance. This is theoretically plausible because system- and HR-driven interventions can translate into environmental outcomes through immediate operational controls, compliance routines, and resource-allocation decisions that do not fully depend on changes in awareness or culture.

2. METHODOLOGY

2.1 Research design

This study adopts a quantitative approach with a cross-sectional survey design to empirically test a theoretical model that integrates eco-conscious HRM and sustainable work systems in shaping corporate environmental performance through the mediating roles of employee ecological consciousness and sustainability culture [24].

2.2 Population and sampling

The population consists of manufacturing firms operating in West Java Province, as listed in the 2024 BPS directory, comprising 8,239 companies. A two-stage sampling technique was employed. In the first stage, proportional area random sampling was used to select five major industrial zones: Jababeka, MM2100, KIIC, EJIP, and GIIC. In the second stage, purposive sampling was applied based on the following criteria: companies that explicitly incorporate sustainability in their vision and mission, have operated for at least five years, and employ a minimum of 50 workers. The target sample size was set at 300 respondents, consistent with the recommendation of five to ten observations per indicator in structural equation modeling (SEM) [25].

2.3 Instrumentation

Five latent variables were measured using a five-point Likert scale. Eco-conscious HRM (six indicators) was adapted from prior studies, including green recruitment, environmental

training, green performance management, green compensation, employee empowerment, and green leadership [26-28]. Sustainable work systems (six indicators) were derived from earlier frameworks, covering resource efficiency, waste minimization, sustainable job design, eco-friendly technologies, sustainability measurement, and cross-functional collaboration [29-31]. Corporate environmental performance (six indicators) was measured through resource efficiency, waste management, emission control, regulatory compliance, environmental innovation, and environmental risk management [32-34]. Employee ecological consciousness (six indicators) encompassed environmental knowledge, environmental concern, ecological responsibility, ecological motivation, environmental value identification, and consequence awareness [35-37]. Finally, sustainability culture (six indicators) included sustainability values, organizational integration, sustainability leadership, sustainability communication, employee participation, and organizational learning [13, 38].

2.4 Data collection

Data were collected via a structured online questionnaire over eight weeks using a multiple-contact strategy. A pilot test with 30 respondents was conducted to assess the reliability and validity of the instrument. To mitigate common method bias, procedural safeguards were implemented, including questionnaire anonymity, temporal separation of items, randomization of item order, and the inclusion of attention-check questions [39]. Beyond these procedural remedies, common method variance (CMV) was examined using additional statistical diagnostics. First, a full-collinearity assessment was conducted by inspecting variance inflation factors (VIFs) across the latent constructs as a general indicator of potential common method influence. Second, a single-factor diagnostic was examined to evaluate whether the indicators would be dominated by one common factor; the results did not support a single-factor structure. Taken together, these checks complement the procedural safeguards and reduce concerns that CMV unduly drives the observed relationships.

2.5 Data Analysis

Data were analyzed using SEM with a two-step approach [40]. In the first stage, confirmatory factor analysis (CFA) was conducted to validate the measurement model by evaluating convergent validity (factor loadings ≥ 0.70, AVE ≥ 0.50, CR ≥ 0.70) and discriminant validity [41]. In the second stage, the structural model was tested to examine causal relationships and mediating effects using a bootstrapping procedure with 5,000 resamples. Model fit was assessed based on multiple indices: Chi-square/df (< 3.0), CFI (≥ 0.95), TLI (≥ 0.95), RMSEA (≤ 0.08), and SRMR (≤ 0.08) [42]. Preliminary analyses included missing data treatment, outlier detection, normality testing, and multicollinearity assessment.

2.6 Ethical considerations

The study received ethical clearance from the institutional ethics committee. Informed consent was obtained from all participants, and data confidentiality and anonymity were maintained in compliance with data protection principles.

3. RESULTS AND DISCUSSION

3.1 Profile respondents

To provide a clearer understanding of the demographic and organizational context of the survey participants, this study profiles the respondents based on gender, age, educational attainment, organizational position, tenure, and departmental affiliation. Such profiling is crucial to ensure that the sample reflects the diversity of employees across multiple hierarchical levels and functional areas within manufacturing firms in West Java. The characteristics presented in Table 1 not only demonstrate the representativeness of the respondents but also provide an important context for interpreting their perceptions of eco-conscious HRM practices, sustainable work systems, and environmental performance.

Table 1. Profile respondents

Gender	Man	99
	Woman	201
	Total	**300**
Age	< 25 years old	257
	25–34 years old	34
	35–44 years old	5
	$\geq$ 45 years old	4
	Total	**300**
Education Level	High School/Vocational School	279
	Diploma	3
	Bachelor (S1)	14
	Postgraduate (S2/S3)	4
	Total	**300**
Position in the Company	Operator/Staff	280
	Supervisor/Team Leader	11
	Department Manager	9
	Total	**300**
Long Time Working in the Company	< 1 year	6
	1–3 years	242
	4–6 years	36
	> 6 years old	16
	Total	**300**
Department	Engineering	9
	HRD/GA	19
	IT/IS	3
	Logistics	24
	Marketing	38
	Production	207
	Total	**300**

As shown in Table 1, the majority of respondents are female employees under the age of 25, predominantly holding secondary school qualifications and occupying operator or staff-level positions. This reflects the demographic composition of many labor-intensive manufacturing industries in West Java, particularly in textiles, garments, and related sectors. Furthermore, most respondents have relatively short tenures of one to three years, suggesting high labor mobility and turnover within the industry. From a departmental perspective, production units dominate the sample, followed by logistics, marketing, and support functions such as HR, engineering, and IT. These profiles indicate that the data largely capture perspectives from operational-level employees directly engaged in core manufacturing processes. This composition is valuable because it aligns with the research objectives of examining how eco-conscious HRM and sustainable work systems influence environmental performance through employee-level ecological awareness

and organizational culture.

3.2 Common method bias, discriminant validity, and robustness evidence

To minimize concerns that the estimated relationships are driven by measurement artefacts, we assessed CMV, discriminant validity, and additional robustness evidence prior to interpreting the structural results. CMV was examined using full-collinearity diagnostics based on the latent construct score structure, indicating VIF values ranging from 2.892 to 6.204 (CEP = 5.863; EEA = 4.189; EHRM = 2.892; SOC = 5.706; SWS = 6.204). These values indicate moderate overlap among closely related sustainability constructs, which is theoretically expected in manufacturing sustainability settings where system, culture, and performance tend to co-move, while remaining below levels commonly associated with severe multicollinearity. Discriminant validity was evaluated using the heterotrait–monotrait ratio (HTMT). HTMT values range from 0.727 to 0.957, with the highest associations observed for SWS–CEP (0.957), SWS–SOC (0.924), and SOC–CEP (0.923), suggesting strong conceptual proximity among system-, culture-, and performance-related constructs; therefore, we complement these diagnostics with robustness checks on model specification to ensure substantive (rather than purely methodological) explanations of the observed magnitudes.

Beyond these diagnostics, we examined whether the main conclusions depend on a single causal-ordering assumption, given the cross-sectional design. We estimated an alternative (reversed) structural specification in which sustainability culture (SOC) is treated as an antecedent that drives EHRM and SWS, rather than being shaped by them. The results indicate that reversing the ordering does not change the substantive conclusion: SWS remains the dominant predictor of corporate environmental performance (CEP) and the key driver of both mediators, while EHRM primarily relates to SOC. Importantly, the proposed specification remains the more coherent and parsimonious representation of the mechanism, as it explains SOC strongly as an organizational outcome of EHRM and SWS (R^2 for SOC = 0.752), whereas treating EHRM as an outcome of SOC (and SWS) yields lower explained variance (R^2 for EHRM = 0.651).

Finally, because employee ecological awareness (EEA) and SOC are conceptually interrelated, we tested whether mediation is better represented as a serial mechanism rather than two parallel mediators. Two alternative serial specifications were evaluated: EHRM/SWS → EEA → SOC → CEP and EHRM/SWS → SOC → EEA → CEP. The linkage between EEA and SOC is substantial in both directions. When specifying EEA as an antecedent of SOC while controlling for EHRM and SWS, EEA shows a meaningful association with SOC ($\beta = 0.425$) and increases the explained variance of SOC from 0.752 to 0.812. Conversely, when specifying SOC as an antecedent of EEA while controlling for EHRM and SWS, SOC shows a strong association with EEA ($\beta = 0.572$) and increases the explained variance of EEA from 0.666 to 0.747. However, introducing these serial links does not alter the main conclusion regarding CEP, which remains most strongly explained by SWS alongside the contributions of EEA and SOC. For parsimony and interpretability—and given the possibility of reciprocal reinforcement between awareness and culture in cross-sectional data—we retain the parallel mediation structure as the main model and treat the

serial specifications as robustness evidence.

3.3 Coefficient of determination (R^2)

Following the diagnostic checks and robustness evidence reported above, the explanatory power of the proposed structural model was evaluated using the coefficient of determination (R^2) for each endogenous construct. Table 2 presents the R^2 and adjusted R^2 values for CEP, EEA, and SOC.

Table 2. R^2 results

	R^2	R^2 Adjusted
CEP	0.829	0.827
EEA	0.666	0.664
SOC	0.752	0.750

Table 2 shows the R^2 values that indicate the explanatory power of the proposed model for each endogenous construct. The results reveal that CEP has the highest R^2 value at 0.829 (adjusted 0.827), suggesting that more than 82% of the variance in CEP can be explained by eco-conscious HRM, sustainable work systems, employee ecological awareness, and sustainability culture. EEA records an R Square of 0.666 (adjusted 0.664), indicating that approximately two-thirds of its variance is accounted for by the model, primarily through sustainable work systems and eco-conscious HRM practices. SOC also shows a strong explanatory level with an R Square of 0.752 (adjusted 0.750), meaning that about 75% of its variance is explained by the predictors. These values collectively demonstrate that the structural model has substantial predictive accuracy, with particularly high explanatory power for CEP, reinforcing the robustness of the theoretical framework in capturing the dynamics of sustainability transformation within the manufacturing sector.

3.4 Path coefficient

To examine the causal relationships among the constructs in the proposed model, the path coefficients were analyzed. This procedure evaluates the strength and significance of direct effects between eco-conscious HRM (EHRM), sustainable work systems (SWS), EEA, SOC, and CEP. Table 3 presents the results of the path coefficient analysis, including the original sample values, mean values, standard deviations, t-statistics, and corresponding p-values.

The results in Table 3 demonstrate several important findings. EEA significantly influences CEP ($\beta = 0.199$; $p = 0.001$), confirming its role as a meaningful mediator. EHRM, however, does not show a significant direct effect on CEP ($\beta = 0.055$; $p = 0.217$), nor on EEA ($\beta = 0.087$; $p = 0.240$), suggesting that its contribution is more indirect, particularly through sustainability culture. Indeed, EHRM has a significant effect on SOC ($\beta = 0.235$; $p = 0.001$), highlighting the importance of HR-driven initiatives in shaping organizational sustainability values.

SOC itself exerts a significant positive effect on CEP ($\beta = 0.256$; $p = 0.000$), reinforcing its role as an organizational-level mediator. SWS emerge as the strongest predictors, with highly significant effects on CEP ($\beta = 0.458$; $p = 0.000$), EEA ($\beta = 0.746$; $p = 0.000$), and SOC ($\beta = 0.670$; $p = 0.000$). These results indicate that sustainable work systems not only enhance environmental performance directly but also indirectly through fostering employee ecological awareness and strengthening sustainability culture.

Table 3. Path coefficient results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
EEA → CEP	0.199	0.200	0.061	3.267	**0.001**
EHRM → CEP	0.055	0.052	0.044	1.235	**0.217**
EHRM → EEA	0.087	0.091	0.074	1.176	**0.240**
EHRM → SOC	0.235	0.240	0.070	3.330	**0.001**
SOC → CEP	0.256	0.263	0.071	3.611	**0.000**
SWS → CEP	0.458	0.454	0.066	6.981	**0.000**
SWS → EEA	0.746	0.743	0.065	11.497	**0.000**
SWS → SOC	0.670	0.665	0.065	10.317	**0.000**

Overall, the findings confirm the robustness of the proposed model, where sustainable work systems play a central role in improving environmental performance, while eco-conscious HRM contributes indirectly through cultural transformation rather than immediate behavioral outcomes.

To further contextualize the magnitude of the structural relationships, effect sizes (f^2) were examined. The results indicate that sustainable work systems exhibit substantial explanatory contributions to employee ecological awareness and sustainability culture, whereas eco-conscious HRM demonstrates a comparatively smaller contribution to sustainability culture. Together with the discriminant validity and CMV diagnostics reported earlier, these results suggest that the estimated effects reflect substantive relationships rather than methodological artefacts.

3.5 Specific indirect effect

To further examine the mediating mechanisms within the structural model, the specific indirect effects were tested. This analysis allows for the evaluation of how EHRM and SWS influence CEP indirectly through EEA and SOC. Table 4 presents the results of the specific indirect effect analysis, including the coefficient values, standard deviations, t-statistics, and significance levels.

Table 4. Specific indirect effect results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
EHRM → EEA → CEP	0.017	0.018	0.017	1.045	0.296
SWS → EEA → CEP	0.149	0.149	0.047	3.135	0.002
EHRM → SOC → CEP	0.060	0.063	0.026	2.316	0.021
SWS → SOC → CEP	0.171	0.175	0.051	3.333	0.001

The findings in Table 4 provide important insights into the role of mediators. The indirect path from EHRM through EEA to CEP is not significant ($\beta = 0.017$; $p = 0.296$), suggesting that employee ecological awareness does not adequately transmit the influence of eco-conscious HRM on environmental performance. However, the indirect effect of EHRM through SOC to CEP is significant ($\beta = 0.060$; $p = 0.021$), indicating that eco-conscious HRM practices are more effective when they foster a supportive sustainability culture rather than relying solely on individual awareness.

For sustainable work systems, both mediation pathways demonstrate significant effects. The indirect path from SWS through EEA to CEP is substantial and significant ($\beta = 0.149$; $p = 0.002$), showing that sustainable work practices strongly enhance ecological awareness, which subsequently improves environmental performance. Likewise, the path from SWS through SOC to CEP is also significant ($\beta = 0.171$; $p = 0.001$), confirming that sustainability culture serves as a critical organizational conduit for translating sustainable work systems into superior environmental outcomes.

Taken together, these results emphasize that sustainable work systems not only exert direct effects but also generate strong indirect impacts on environmental performance through both employee-level and organizational-level mediators. In contrast, eco-conscious HRM demonstrates a more limited role, with its influence being channeled primarily through cultural transformation rather than individual awareness.

3.6 Discussion

The Role of Eco-Conscious HRM in Environmental Performance

The findings reveal that eco-conscious HRM exerts a significant influence on sustainability culture but does not directly affect employee ecological awareness. This result supports the argument that green HRM practices are more effective in driving systemic change through cultural transformation rather than through individual awareness [1]. It also resonates with institutional change theory, which posits that HRM practices serve as institutional mechanisms that shape organizational culture and shared values [43].

The non-significance of the direct effect on individual awareness underscores the complexity of transforming personal values and behaviors within organizational settings. Prior studies have argued that green HRM practices require a psychological green climate as a mediating condition for influencing individual green behaviors [12]. In this light, the present findings suggest that eco-conscious HRM must move beyond policy and procedural emphasis to include the creation of supportive environments that encourage individual ecological transformation.

The Effectiveness of Sustainable Work Systems

The study demonstrates that sustainable work systems have a stronger and more comprehensive impact on environmental

performance than eco-conscious HRM. This outcome corroborates the systems thinking perspective, which emphasizes that sustainable work systems operate at multiple levels and generate synergistic effects surpassing those of isolated practices [31]. Such systemic influence arises because sustainable work systems holistically integrate technological, organizational, and human elements [30]. Consistent with the structural results, sustainable work systems show the strongest relationship with employee ecological awareness ($\beta = 0.746$; $p < 0.001$), indicating that system-level sustainability practices are highly effective in shaping employees' environmental cognition.

The strong linkage between sustainable work systems and employee ecological awareness may reflect the high day-to-day visibility of operational sustainability practices in manufacturing settings (e.g., waste handling routines, resource-efficiency procedures, and eco-friendly job design). Such systems provide continuous cues and reinforcement, making sustainability salient and cognitively accessible to employees, thereby elevating ecological awareness. This interpretation is consistent with the notion that system-level work design can shape micro-level perceptions and awareness through repeated exposure and routinization.

From the perspective of the resource-based view, this superior effectiveness is attributable to the ability of sustainable work systems to create integrated capabilities that are rare, valuable, and difficult to imitate [44]. These capabilities are embedded within organizational processes, structures, and culture, producing sustainable environmental performance that is difficult for competitors to replicate [45].

Notably, the relative magnitude of effects also indicates that sustainable work systems tend to be more influential than eco-conscious HRM in this context. The comparatively smaller effect of eco-conscious HRM (relative to sustainable work systems) can be explained by the immediacy and tangibility of work-system interventions in manufacturing environments. Sustainable work systems are experienced continuously through operational routines, equipment, job design, and process controls, whereas HRM practices may be perceived as episodic, policy-driven, or less visible to shop-floor employees. This distinction is particularly relevant given that the sample is dominated by operational-level employees, for whom system-level cues are more salient in shaping sustainability-related perceptions and behaviors.

Our findings align with prior sustainability and green HRM research, arguing that system-level work design and operational routines can yield stronger proximal effects than policy-level HR initiatives, particularly in manufacturing contexts. The comparatively modest HRM effects and stronger system effects are therefore theoretically plausible, while the additional diagnostics reported in this revision reduce concerns that the observed magnitudes are methodological artefacts.

Mediating Mechanisms in Sustainability Transformation

One of the most notable results is the stronger mediating effect of sustainability culture compared to individual ecological awareness. This finding validates the cultural theory of organizational change, which posits that sustainable organizational transformation occurs at the level of underlying assumptions and shared values [46]. Sustainability culture thus functions as a social control mechanism that shapes individual behavior through normative pressures and collective expectations [47].

The dual mediation mechanism enriches the understanding of the pathways to environmental performance. Prior studies highlight that green organizational culture creates a context that enables the translation of individual environmental awareness into collective action [5]. Conversely, individual awareness without cultural reinforcement often results in sporadic and unsustainable behaviors [35]. These findings underscore the need to prioritize cultural reinforcement as a prerequisite for converting individual ecological consciousness into lasting organizational outcomes.

Theoretical Contributions to Sustainable HRM

This study contributes to the development of sustainable HRM theory by integrating individual and organizational perspectives into a unified model. The identification of dual mediation mechanisms extends existing frameworks by showing that different transformation pathways require distinct intervention strategies. This aligns with multi-level theory, which emphasizes that organizational phenomena emerge through cross-level interactions among individual, group, and organizational factors [48].

Furthermore, the model supports contingency theory in the sustainability context, illustrating that the effectiveness of interventions depends on alignment among practices, processes, and cultural contexts [49]. Eco-conscious HRM appears to be more effective in facilitating cultural transformation, whereas sustainable work systems exert broader influence across multiple pathways. Together, these findings demonstrate the complementary nature of HRM and systemic approaches to sustainability.

Implications for Strategic Management

The results provide strategic guidance for organizations seeking to enhance environmental performance through human resource management. A key implication is the importance of an integrated approach that combines people-focused interventions with systems-focused practices [50]. Organizations that rely solely on green HRM practices without transforming underlying work systems are likely to achieve only limited outcomes.

The stronger role of sustainability culture as a mediator highlights the need for culture-centric strategies in sustainability transformation. This includes developing sustainability-oriented leadership, embedding environmental values in organizational practices, and creating supportive contexts for green behaviors [38]. Although cultural transformation requires a longer time horizon, it fosters more sustainable and enduring changes [51].

Implications for the Manufacturing Industry

In the context of the manufacturing sector, the findings highlight the importance of adopting a systemic approach to sustainability transformation. Manufacturing firms must embed environmental considerations into core operational processes rather than treating them as add-on compliance activities [32]. This perspective is consistent with lean manufacturing and industrial ecology principles, which emphasize resource efficiency and waste minimization as integral to operational excellence [52].

The significant impact of sustainable work systems in this sector can also be explained by operations management theory, which recognizes that process improvements and technological innovations directly affect environmental

outcomes [53]. Manufacturing firms that successfully integrate sustainability into their operations strategies are more likely to achieve superior environmental and economic performance simultaneously.

Limitations and Future Research Directions

Several limitations should be acknowledged. The cross-sectional design restricts the ability to establish definitive causal relationships, suggesting the need for longitudinal studies to validate the pathways identified [54]. Moreover, the focus on a single industry and geographic region limits the external validity of the findings.

Future research could examine moderating factors such as organizational size, ownership structure, and technological sophistication to provide deeper insights into boundary conditions [55]. Investigating industry-specific and regulatory contexts could also enrich understanding of sustainability dynamics. In addition, cross-cultural studies are needed to assess the applicability of the proposed model in diverse cultural environments, given the central role of culture in sustainability transformation.

4. CONCLUSION

This study advances understanding of how eco-conscious HRM and sustainable work systems contribute to corporate environmental performance in the Indonesian manufacturing sector. The results confirm that eco-conscious HRM exerts its strongest influence through shaping sustainability culture, whereas sustainable work systems demonstrate broader and more direct effects across multiple pathways. Among the mediators, sustainability culture proves to be more effective than individual ecological awareness, underscoring the pivotal role of cultural transformation in embedding sustainability within organizational practices. Theoretically, the research contributes to the sustainable HRM literature by integrating micro-level (individual awareness) and macro-level (organizational culture) perspectives into a dual mediation model. This enriches multi-level theory and highlights the complementary roles of HRM practices and systemic work design in advancing sustainability. Practically, the findings provide strategic guidance for manufacturing firms to prioritize integrated approaches that combine people-focused initiatives with systemic interventions, while investing in long-term cultural transformation as a foundation for enduring environmental outcomes. Several limitations should be acknowledged, including the cross-sectional design and the focus on a single industrial region, which constrain the generalizability of results. Future research should adopt longitudinal designs, incorporate comparative industry or cross-country perspectives, and explore moderating effects of organizational characteristics such as size, ownership, and technological sophistication. Such efforts would further clarify the boundary conditions of the proposed model and enhance its global applicability.

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