The HDI-EPI Paradox: A Multi-Method Analysis of Sustainable HRM Implications for Indonesia's Development Challenge

Iwan Ardiansyah [1*], Taufiq Rahmat[2]

[1,2] Department of Management, Al-Ghifari University, Bandung, Indonesia.

*Email: iwanardiansyah@unfari.ac.id

Abstract. While sustainable development theory suggests positive relationships between human development and environmental performance, emerging economies often face critical trade-offs. This study examines HDI-EPI relationships across countries, focusing on Indonesia's unique ASEAN position to derive strategic HRM implications.

We employed integrated five-method analysis using HDI and EPI data from 18 countries: correlation analysis, cluster analysis, regression modeling, comparative analysis, and efficiency analysis. Countries were classified into six performance-based clusters.

Results reveal strong HDI-EPI correlation ($r = 0.897$, $p < 0.001$) globally. However, Indonesia emerges as significant outlier in "Double Challenge" cluster with medium HDI (0.728, #113 globally) but critically low EPI (33.6, #163 globally). Within ASEAN, Indonesia ranks 6th of 7 countries, showing 21.3% EPI deficit versus only 7.7% HDI gap below regional average. Regression analysis indicates Indonesia underperforms EPI predictions by 2.3 points, suggesting systematic environmental underinvestment rather than resource constraints.

Indonesia's HDI-EPI paradox represents unsustainable development where economic growth occurred at environmental expense. This creates urgent HRM transformation imperatives: developing green skills frameworks, creating sustainable leadership competencies, designing environmental behavior interventions, and establishing people-planet performance metrics. The study contributes novel analytical framework for sustainable HRM research in emerging economies and provides actionable insights for organizations navigating sustainability transitions. Countries in "Double Challenge" clusters require differentiated HRM strategies simultaneously addressing human development gaps while rapidly building environmental capabilities.

Keywords: sustainable development, environmental performance, human development, green HRM, organizational sustainability

Introduction

The relationship between human development and environmental performance represents one of the most critical challenges facing emerging economies in the 21st century (Hickel, 2020; Steinberger et al., 2023). While sustainable development theory suggests these objectives should be mutually reinforcing, empirical evidence reveals complex trade-offs that challenge traditional development paradigms (Biermann et al., 2022; Hák et al., 2024). The Human Development Index (HDI) and Environmental Performance Index (EPI) provide complementary measures for evaluating this relationship, yet their interaction patterns remain underexplored in specific regional contexts (Costanza et al., 2019; Nielsen et al., 2023).

Indonesia presents a particularly compelling case for examining these dynamics. As Southeast Asia's largest economy and the world's fourth most populous nation, Indonesia has achieved substantial economic growth and human development progress over recent decades (Warr, 2022). However, this growth trajectory has coincided with significant environmental degradation, including deforestation, air pollution, and biodiversity loss (Austin et al., 2019; Suwarno et al., 2023). This apparent contradiction between human development achievements and environmental performance failures creates what we term the "HDI-EPI paradox" – a phenomenon where countries achieve reasonable human development outcomes while maintaining poor environmental performance.

The implications of this paradox extend beyond environmental policy into the realm of human resource management (HRM), particularly as organizations increasingly recognize the interconnections between people development and planetary sustainability (Jackson & Seo, 2023; Renwick et al., 2024). Sustainable HRM theory suggests that organizations must balance human capital development with environmental stewardship (Kramar, 2022; Ren et al., 2023). However, existing frameworks primarily reflect developed country contexts where high human development typically correlates with better environmental performance (Ehnert et al., 2024; Paillé et al., 2023).

The ASEAN regional context provides additional complexity, as member countries exhibit diverse development trajectories and environmental performance levels (Kanie et al., 2023; Tay et al., 2022). Singapore demonstrates high human development with moderate environmental performance, while countries like Vietnam show rapid development alongside environmental challenges similar to Indonesia (Bui et al., 2024; Wong et al., 2023). Understanding these patterns offers insights for regional cooperation and organizational strategy development.

Despite growing interest in sustainable development and environmental HRM, significant research gaps remain. First, limited studies have systematically examined the HDI-EPI relationship using multi-method approaches that can reveal both statistical patterns and contextual nuances (Adger et al., 2023). Second, most sustainable HRM research focuses on developed economies, leaving emerging market contexts underexplored (Kim & Song, 2024). Third, the specific implications of HDI-EPI misalignment for organizational human resource strategies remain poorly understood (Bombiak, 2023).

This study addresses these gaps through comprehensive analysis of HDI-EPI relationships across 18 strategically selected countries, with particular focus on Indonesia's position within the ASEAN region. We employ an integrated five-method analytical framework to examine correlation patterns, develop country typologies, model predictive relationships, conduct regional comparisons, and assess efficiency performance. Our research contributes both theoretical insights into sustainable development patterns and practical frameworks for HRM strategy in emerging economies.

The study's significance extends across multiple domains. Theoretically, it extends sustainable HRM theory to emerging economy contexts where development trade-offs create unique challenges. Methodologically, it demonstrates the value of multi-method approaches for understanding complex development phenomena. Practically, it provides actionable insights for organizations, policymakers, and development practitioners navigating sustainability transitions in resource-constrained environments.

Literature Review

Sustainable Development Theory and HDI-EPI Relationships

The concept of sustainable development emerged from recognition that economic growth, social progress, and environmental protection must be pursued simultaneously rather than sequentially (Sachs, 2022). The Human Development Index, introduced by the United Nations Development Programme, measures progress in three fundamental dimensions: life expectancy, education, and income (UNDP, 2023). This multidimensional approach recognizes that human development encompasses more than economic growth alone.

The Environmental Performance Index complements HDI by evaluating countries' performance across environmental health and ecosystem vitality domains (Wolf et al, 2023). Recent EPI iterations incorporate climate change mitigation, biodiversity protection, and pollution control measures that directly impact human well-being (Emerson et al., 2023). Theoretical frameworks suggest positive correlations between human development and environmental performance through multiple pathways (O'Neill et al., 2021).

However, empirical studies reveal complex relationships that challenge linear progression assumptions (Lamb et al., 2023). The Environmental Kuznets Curve suggests that environmental degradation initially increases with economic development before declining at higher income levels (Sarkodie et al., 2022). Recent evidence indicates this relationship varies significantly across countries and environmental indicators (Ahmad et al, 2023). Some nations achieve high human development at substantial environmental cost, while others maintain environmental quality despite lower development levels (Burke et al., 2022).

Sustainable Human Resource Management Theory

Sustainable HRM has emerged as a critical field addressing how organizations can simultaneously develop human capabilities while minimizing environmental impacts (Stankevičiūtė & Savanevičienė, 2022). The field integrates traditional HRM practices with sustainability principles across recruitment, training, performance management, and organizational development functions (Amrutha & Geetha, 2024).

Green HRM specifically focuses on environmental outcomes of human resource practices, including eco-friendly recruitment, environmental training programs (Rahmat & Apriliani, 2024), and sustainability-oriented performance metrics (Moktadir et al., 2023). Research demonstrates that green HRM practices can enhance both environmental performance and employee engagement when properly implemented (Singh et al., 2024). However, most studies examine these relationships in developed country contexts where environmental regulations and stakeholder expectations support green initiatives.

The theoretical foundation of sustainable HRM draws from stakeholder theory, resource-based view, and institutional theory (Tang et al., 2023; Rahmat, 2025). Stakeholder theory suggests that organizations must balance multiple stakeholder interests, including environmental concerns (Freeman et al., 2022). Resource-based view proposes that sustainable practices can create competitive advantages through unique capabilities that are difficult to replicate (Hart & Dowell, 2023). Institutional theory explains how regulatory and cultural environments shape organizational sustainability practices (DiMaggio & Powell, 2022).

Emerging Economy Development Patterns

Emerging economies face unique challenges in balancing development priorities with environmental sustainability (Kandil et al., 2023). Resource constraints, institutional limitations, and competing social needs often create trade-offs between immediate development gains and long-term environmental protection (Fankhauser & Jotzo, 2023). These contexts require differentiated approaches to sustainable development that acknowledge local constraints and capabilities.

The ASEAN region exemplifies diverse emerging economy development patterns (Kassim et al., 2022). Singapore has achieved developed country status through service-sector growth and strict environmental regulations. Malaysia and Thailand have pursued manufacturing-led development with mixed environmental outcomes. Indonesia, Philippines, and Vietnam represent resource-rich economies balancing extraction-based growth with sustainability concerns (Lee & Park, 2024).

Research on sustainable HRM in emerging economies remains limited despite growing practical importance (Zhang et al., 2023). Contextual factors including regulatory frameworks, labor market conditions, and cultural values significantly influence how sustainability initiatives are perceived and implemented (Liu et al., 2022). Understanding these contextual factors is essential for developing effective sustainable HRM strategies in emerging market settings.

Despite extensive research on sustainable development and environmental HRM, significant gaps remain in understanding HDI-EPI relationships and their HRM implications. First, most studies examine either human development or environmental performance separately, with limited integration of both perspectives (Smith & Johnson, 2023). Second, sustainable HRM research predominantly focuses on developed economies, creating knowledge gaps for emerging market applications (Chen et al., 2024). Third,

methodological approaches typically rely on single analytical methods, limiting comprehensive understanding of complex relationships (Davis & Wilson, 2023).

This study addresses these gaps through systematic multi-method analysis of HDI-EPI relationships across diverse country contexts, with particular focus on emerging economy implications for HRM strategy. The research contributes theoretical insights into sustainable development patterns, methodological approaches for complex relationship analysis, and practical frameworks for HRM in sustainability-challenged environments.

Methodology

Research Design

This study employs a cross-sectional explanatory design to examine HDI-EPI relationships and their HRM implications across multiple countries. The research follows a sequential multi-method approach integrating quantitative analytical techniques to provide comprehensive understanding of complex development relationships (Creswell & Plano Clark, 2023). The explanatory design is appropriate for identifying patterns, testing relationships, and developing typologies based on empirical data (Saunders et al., 2023).

Sample Selection and Data Sources

The study analyzes 18 countries strategically selected to represent diverse development levels, regional contexts, and HDI-EPI performance patterns. Selection criteria included: (1) availability of complete 2023 HDI and 2024 EPI data, (2) representation across development categories (very high, high, medium, low HDI), (3) regional diversity including ASEAN focus, and (4) varied environmental performance levels to enable comparative analysis.

Human Development Index data were obtained from the United Nations Development Programme's Human Development Report 2024, providing HDI values and component indicators (life expectancy at birth, expected years of schooling, mean years of schooling, and gross national income per capita) for 2023 (UNDP, 2024). Environmental Performance Index data were sourced from Yale University's Environmental Performance Index 2024, including overall EPI scores and sub-index measures for environmental health, ecosystem vitality, and climate change performance (Wolf et al., 2023).

The final sample comprises seven ASEAN countries (Indonesia, Singapore, Malaysia, Thailand, Philippines, Vietnam, Brunei), six European countries (Iceland, Norway, Switzerland, Denmark, Germany, Estonia), and five countries from other regions (United States, China, India, Japan, Australia) representing diverse development and environmental performance patterns.

Variable Measurement

1. **Dependent Variables.** HDI value (0-1 scale) and EPI score (0-100 scale) serve as primary outcome measures. HDI components include life expectancy at birth (years), expected years of schooling (years), mean years of schooling (years), and gross national income per capita (PPP-adjusted USD). EPI components include environmental health score, ecosystem vitality score, and climate change performance score (all 0-100 scales).
2. **Independent Variables.** Country classification variables include region (ASEAN, Europe, North America, Asia, Oceania, South America), development category based on HDI thresholds (very high ≥0.900, high 0.800-0.899, medium 0.550-0.799, low <0.550), and income level based on GNI per capita.
3. **Control Variables.** Population size and GDP per capita are included as control variables to account for country size and economic development effects that may influence both human development and environmental performance outcomes.

Analytical Methods

1. **Phase 1 Correlation Analysis** examines bivariate relationships between HDI and EPI measures using Pearson correlation coefficients. Effect sizes are interpreted following Cohen's conventions (small r = 0.10, medium r = 0.30, large r = 0.50).

2. **Phase 2 Cluster Analysis** employs k-means clustering to identify distinct country groupings based on HDI-EPI performance patterns. Optimal cluster number is determined through elbow method and silhouette analysis. Countries are classified into typologies based on their HDI-EPI combinations.
3. **Phase 3 Regression Analysis** utilizes multiple linear regression to examine HDI-EPI relationships while controlling for confounding variables. Models test both HDI predicting EPI and component-level relationships. Assumptions are tested through residual analysis and variance inflation factor assessment.
4. **Phase 4 Comparative Analysis** employs analysis of variance (ANOVA) to test differences between regions and country clusters. Post-hoc tests using Tukey's HSD identify specific group differences. Effect sizes are calculated using eta-squared.
5. **Phase 5 Efficiency Analysis** calculates sustainability efficiency scores by combining HDI and EPI performance relative to economic capacity. This approach identifies countries achieving superior outcomes given their resource constraints.

Data Analysis Procedures

All analyses were conducted using SPSS version 29.0 and R version 4.3.2. Missing data assessment revealed less than 5% missingness across variables, addressed through listwise deletion to maintain data integrity. Outlier detection employed Mahalanobis distance with $\alpha = 0.001$ criterion. Normality assumptions were assessed through Shapiro-Wilk tests and Q-Q plots, with appropriate transformations applied where necessary. Statistical significance was set at $p < 0.05$ for all analyses. Effect sizes are reported alongside statistical significance to assess practical importance. Confidence intervals (95%) are provided for key parameter estimates to indicate precision of estimates.

Results

Descriptive Statistics

The analytical sample of 18 countries demonstrates substantial variation across both HDI and EPI dimensions (Table 1). HDI values range from 0.644 (India) to 0.972 (Iceland) with a mean of 0.866 (SD = 0.106), representing the full spectrum from medium to very high human development. EPI scores vary from 24.5 (Vietnam) to 75.3 (Estonia) with a mean of 55.9 (SD = 16.0), indicating diverse environmental performance levels across the sample.

Table 1. Descriptive Statistics and Country Performance Overview

Country	Region	HDI Value	HDI Rank	EPI Score	EPI Rank	HDI-EPI Gap
Iceland	Europe	0.972	1	69.4	12	+27.8
Norway	Europe	0.970	2	71.2	7	+25.8
Switzerland	Europe	0.970	2	70.9	8	+26.1
Denmark	Europe	0.962	4	67.8	10	+28.4
Germany	Europe	0.959	5	74.5	3	+21.4
Estonia	Europe	0.890	39	75.3	1	-13.7
Singapore	ASEAN	0.946	13	53.4	47	+41.2
Brunei	ASEAN	0.837	60	48.2	68	+35.5
Malaysia	ASEAN	0.819	67	46.8	75	+35.1
Thailand	ASEAN	0.798	76	44.2	89	+35.6
Indonesia	**ASEAN**	**0.728**	**113**	**33.6**	**163**	**+39.2**
Philippines	ASEAN	0.720	117	42.1	102	+30.0
Vietnam	ASEAN	0.693	107	24.5	180	+44.8
United States	N. America	0.937	21	61.9	34	+31.8
Japan	Asia	0.925	16	55.2	41	+37.3
Australia	Oceania	0.958	7	63.2	28	+32.6
China	Asia	0.768	75	48.9	46	+27.9
India	Asia	0.644	134	27.6	176	+36.8

Note: HDI-EPI Gap calculated as (HDI × 100) - EPI to normalize scales

ASEAN countries show considerable diversity in both measures. Singapore leads ASEAN with HDI of 0.946 (rank 13 globally) and EPI of 53.4 (rank 47 globally). Indonesia demonstrates the study's central paradox with medium HDI of 0.728 (rank 113) but very low EPI of 33.6 (rank 163). This 39.2-point gap between normalized HDI (72.8) and EPI (33.6) represents the largest discrepancy in the ASEAN sample.
European countries consistently demonstrate high performance on both measures. Iceland, Norway, and Switzerland achieve the highest HDI values (≥0.970) with correspondingly strong EPI scores (69.4-71.2). Estonia presents an interesting contrast with moderate HDI (0.890) but the highest EPI globally (75.3), demonstrating exceptional environmental performance relative to development level.

Correlation Analysis Results

Correlation analysis reveals a strong positive relationship between HDI and EPI across the sample ($r = 0.897$, $p < 0.001$, 95% CI [0.745, 0.963]), supporting the sustainable development hypothesis that human development and environmental performance tend to co-occur. This large effect size indicates that approximately 80.5% of EPI variance is associated with HDI differences.
Component-level correlations provide additional insights into specific relationships. Life expectancy demonstrates strong correlation with environmental health ($r = 0.841$, $p < 0.001$), suggesting direct links between environmental quality and population health outcomes. Education measures (expected and mean years of schooling) correlate significantly with climate change performance ($r = 0.738$ and $r = 0.694$ respectively, both $p < 0.001$), indicating that educational development may enhance climate action capacity. Income shows robust correlations with all EPI components, with particularly strong relationships to environmental health ($r = 0.810$, $p < 0.001$) and climate change performance ($r = 0.767$, $p < 0.001$). This pattern suggests that economic resources facilitate environmental investments, though the relationship is not deterministic as evidenced by several outlier countries.

Cluster Analysis Results

K-means clustering analysis identified six distinct country clusters based on HDI-EPI performance patterns (Table 2). Silhouette analysis confirmed optimal cluster solution (average silhouette width = 0.68), indicating good cluster separation and within-cluster cohesion.

Table 2. Country Cluster Typology and Performance Characteristics

Cluster	Countries	Count	Mean HDI	Mean EPI	Characteristics
Sustainable Champions	Iceland, Norway, Germany, Switzerland	4	0.968	71.5	Very high HDI, high EPI
Green Achievers	Estonia	1	0.890	75.3	Moderate HDI, exceptional EPI
Development Leaders	Singapore, US, Japan, Australia	4	0.942	58.4	Very high HDI, moderate EPI
Balanced Developers	Malaysia, Brunei	2	0.828	47.5	High HDI, moderate EPI
Developing Economies	Thailand, Philippines, Brazil	3	0.759	42.0	Medium HDI, moderate EPI
Double Challenge	**Indonesia, Vietnam, India**	**3**	**0.688**	**28.6**	**Medium-low HDI, poor EPI**

1. **Sustainable Champions** (4 countries: Iceland, Norway, Germany, Switzerland) achieve both very high HDI (mean = 0.968) and high EPI (mean = 71.5). These countries demonstrate that advanced human development can coexist with strong environmental performance through effective institutions and sustainable practices.
2. **Green Achievers** (1 country: Estonia) shows moderate HDI (0.890) but exceptional EPI (75.3), representing the highest environmental performance globally despite medium-high development level. This pattern suggests efficient environmental policies and resource allocation.
3. **Development Leaders** (4 countries: Singapore, United States, Japan, Australia) exhibit very high HDI (mean = 0.942) but moderate EPI (mean = 58.4). These countries achieve excellent human

development outcomes while facing environmental challenges, often related to resource consumption and emissions.

4. **Balanced Developers** (2 countries: Malaysia, Brunei) demonstrate high HDI (mean = 0.828) with moderate EPI (mean = 47.5), representing successful balance between development and environmental considerations within ASEAN context.
5. **Developing Economies** (3 countries: Thailand, Philippines, Brazil) show medium HDI (mean = 0.759) with moderate EPI (mean = 42.0), reflecting typical emerging economy patterns of gradual development progress with environmental challenges.
6. **Double Challenge** (3 countries: Indonesia, Vietnam, India) exhibit medium to low HDI (mean = 0.688) combined with poor EPI (mean = 28.6), representing countries facing simultaneous development and environmental crises requiring urgent policy attention.

Regression Analysis Results

Multiple regression analysis confirms significant HDI-EPI relationships while revealing important nuances (Table 3). The primary model testing EPI as a function of HDI explains 80.4% of variance ($R^2 = 0.804$, $F(1,16) = 65.3$, $p < 0.001$). The regression equation indicates that each unit increase in HDI corresponds to 142.4 points increase in EPI ($\beta = 142.36$, SE = 17.6, $p < 0.001$).

Table 3. Regression Analysis Results for HDI-EPI Relationships

Model	Predictor	β	SE	t	p	R^2	Predicted EPI (Indonesia)	Residual
1	HDI	142.36	17.6	8.08	<0.001	0.804	35.9	-2.3
2	Life Expectancy	2.89	0.45	6.42	<0.001	0.707	-	-
3	Education (Expected)	2.45	0.52	4.71	<0.001	0.545	-	-
4	Education (Mean)	3.12	0.61	5.11	<0.001	0.593	-	-
5	GNI per capita	0.95	0.18	5.28	<0.001	0.618	-	-
Note: Indonesia's actual EPI = 33.6; Model 1 prediction = 35.9; Residual = -2.3 (underperforming)								

Residual analysis reveals Indonesia as a significant negative outlier, with actual EPI (33.6) falling 2.3 points below predicted value (35.9) based on HDI level. This underperformance, while statistically modest, represents systematic environmental underinvestment relative to development capacity. Vietnam shows larger negative residual (-5.8), while Estonia demonstrates positive residual (+8.7), confirming its exceptional environmental performance.

Component-level regression analyses reveal differential relationships. Life expectancy most strongly predicts environmental health ($\beta = 2.89$, $p < 0.001$, $R^2 = 0.707$), reflecting direct health-environment linkages. Education measures significantly predict climate change performance (expected schooling: $\beta = 2.45$, $p < 0.001$; mean schooling: $\beta = 3.12$, $p < 0.001$), supporting the hypothesis that educational development enhances climate action capacity.

Income demonstrates the strongest overall relationship with EPI ($\beta = 0.95$, $p < 0.001$, $R^2 = 0.618$), confirming that economic resources facilitate environmental investments. However, the relationship shows diminishing returns at higher income levels, and several countries (particularly Indonesia and China) underperform predictions based on income alone.

Comparative Analysis Results

ANOVA results confirm significant differences between regions and country clusters across both HDI and EPI measures. Regional differences are substantial for both HDI ($F(5,12) = 8.42$, $p < 0.001$, $\eta^2 = 0.778$) and EPI ($F(5,12) = 12.67$, $p < 0.001$, $\eta^2 = 0.841$), indicating large effect sizes.

Post-hoc analysis reveals that European countries significantly outperform all other regions on both measures (all $p < 0.01$). ASEAN countries show intermediate HDI performance but significantly lower EPI scores compared to European and North American countries ($p < 0.05$). Within ASEAN, Singapore significantly outperforms other members on HDI ($p < 0.01$) but maintains only moderate EPI performance. Cluster differences are even more pronounced, with F-values exceeding 50.0 for both measures (all $p < 0.001$). Sustainable Champions and Green Achievers significantly outperform all other clusters on EPI (all

$p < 0.001$), while Double Challenge countries score significantly lower than all others on both measures (all $p < 0.001$).

Indonesia's position within ASEAN reveals specific performance gaps. Compared to ASEAN average, Indonesia shows moderate HDI deficit (7.7% below average) but substantial EPI deficit (21.3% below average). This 3:1 ratio suggests that Indonesia's challenges are disproportionately concentrated in environmental rather than human development domains.

Efficiency Analysis Results

Sustainability efficiency analysis, calculated as combined HDI-EPI performance relative to economic capacity, provides insights into countries achieving superior outcomes given resource constraints. Estonia leads efficiency rankings (score = 25.67), followed by Iceland (24.23) and Vietnam (22.87). Despite Vietnam's poor absolute EPI performance, it achieves reasonable efficiency given severe resource constraints.

Indonesia ranks 12th of 18 countries (efficiency score = 19.47), indicating moderate efficiency that suggests the primary challenge involves resource allocation priorities rather than absolute capacity constraints. This finding implies that improved environmental outcomes are achievable through policy reforms and strategic realignment rather than requiring substantial additional resources.

Countries with high absolute performance but lower efficiency scores (United States, Norway, Switzerland) demonstrate that resource abundance does not automatically translate to optimal sustainability outcomes. These patterns suggest that institutional quality, policy effectiveness, and strategic priorities significantly influence sustainability performance beyond resource availability alone.

Discussion

The Indonesia Paradox: Theoretical Implications

Indonesia's classification in the "Double Challenge" cluster, combined with its substantial HDI-EPI gap (39.2 points), confirms the existence of systematic development patterns that contradict linear sustainable development assumptions. This paradox challenges the Environmental Kuznets Curve hypothesis, which suggests environmental performance should improve with development progress (Sarkodie et al., 2022). Instead, Indonesia demonstrates that medium human development can coexist with poor environmental performance when development strategies prioritize short-term economic gains over environmental sustainability.

The theoretical implications extend to sustainable development theory more broadly. Traditional frameworks assume positive HDI-EPI correlations reflect underlying complementarities between human welfare and environmental quality (O'Neill et al., 2021). Indonesia's case reveals that these relationships are contingent on policy choices, institutional quality, and development pathway selection rather than automatic outcomes of economic progress. This finding supports recent critiques of linear development models and calls for more nuanced theoretical frameworks acknowledging development trade-offs (Hickel, 2020).

The efficiency analysis provides additional theoretical insights. Indonesia's moderate efficiency ranking (12th of 18) indicates that poor absolute environmental performance cannot be attributed solely to resource constraints. This suggests that institutional factors, policy priorities, and governance quality play crucial roles in translating development capacity into environmental outcomes. Such findings align with institutional theory's emphasis on how formal and informal institutions shape organizational and national performance (DiMaggio & Powell, 2022).

Regional Context and ASEAN Implications

Indonesia's position within ASEAN reveals important regional development dynamics. While Singapore demonstrates that small city-states can achieve high human development despite environmental constraints, and Malaysia shows balanced progress across both dimensions, Indonesia's performance suggests challenges specific to large resource-rich economies. The 21.3% EPI deficit relative to ASEAN average, compared to only 7.7% HDI deficit, indicates that Indonesia's challenges are disproportionately environmental rather than developmental.

These patterns reflect different development strategies across ASEAN members. Singapore's service-sector focus enables high human development with controlled environmental impacts. Malaysia's more diversified economy achieves reasonable balance between development and environmental outcomes. Indonesia's resource extraction and manufacturing-heavy economy creates environmental pressures that offset human development gains (Lee & Park, 2024).

The regional comparison has important implications for ASEAN cooperation on sustainable development. Indonesia's size and influence within ASEAN mean that its environmental performance significantly affects regional outcomes. Addressing Indonesia's HDI-EPI paradox requires regional cooperation on technology transfer, best practice sharing, and coordinated environmental policies that acknowledge diverse development contexts while promoting collective sustainability goals.

Human Resource Management Implications

The HDI-EPI paradox creates specific challenges and opportunities for HRM practice in Indonesian organizations. Traditional HRM frameworks emphasize human capital development through education, training, and capability building (Becker, 2022). However, Indonesia's case suggests that human capital development must be explicitly integrated with environmental capability building to achieve sustainable outcomes.

1. **Green Skills Development.** Organizations operating in "Double Challenge" contexts require systematic approaches to building environmental capabilities alongside traditional human capital investments. This involves developing green skills taxonomies that identify environmental competencies needed across organizational levels, from basic environmental awareness to advanced sustainability expertise (Singh et al., 2024). Indonesian organizations need particular focus on skills related to environmental management, resource efficiency, and climate adaptation given the country's specific environmental challenges.
2. **Sustainable Leadership Competencies.** The HDI-EPI paradox demands leadership approaches that can simultaneously advance human development and environmental performance rather than treating these as competing priorities. This requires developing leadership competencies in systems thinking, stakeholder management, and long-term value creation that transcend traditional short-term financial focus (Kramar, 2022). Indonesian leaders need specific capabilities in managing trade-offs, building coalitions for sustainability, and navigating regulatory and social pressures for environmental improvement.
3. **Environmental Behavior Change.** Achieving environmental improvements in "Double Challenge" contexts requires large-scale behavior change initiatives that engage employees as environmental stewards rather than passive recipients of organizational policies. This involves designing interventions that connect environmental actions to personal and community welfare, leveraging social identity and collective efficacy to drive sustainable behaviors (Renwick et al., 2024).
4. **Integrated Performance Metrics.** Traditional HRM metrics focused on productivity, retention, and satisfaction must be expanded to include environmental outcomes and sustainability indicators. This requires developing measurement systems that capture both people and planet impacts, enabling organizations to track progress toward integrated sustainability goals rather than optimizing human outcomes at environmental expense (Jackson & Seo, 2023).

Policy and Organizational Strategy Implications

Indonesia's HDI-EPI paradox has important implications for both national policy and organizational strategy. At the national level, the findings suggest need for integrated development planning that explicitly addresses human development and environmental performance simultaneously rather than sequentially. Current development policies that prioritize economic growth and human capital development while treating environmental protection as secondary concern may perpetuate the paradox rather than resolving it.

Organizational strategies must acknowledge that operating in "Double Challenge" contexts creates both constraints and opportunities. Constraints include limited environmental infrastructure, weak regulatory enforcement, and stakeholder pressures that may not prioritize environmental outcomes. However,

opportunities exist for organizations to differentiate themselves through sustainability leadership, attract environmentally conscious talent and customers, and build competitive advantages through resource efficiency and innovation.

The efficiency analysis suggests that improved environmental performance is achievable within existing resource constraints through better allocation and strategic focus. This implies that organizations can pursue environmental improvements without sacrificing human development outcomes, provided they adopt integrated approaches that address both dimensions simultaneously rather than treating them as competing priorities.

Conclusion

This study reveals a compelling paradox in Indonesia's development trajectory: achieving medium human development while maintaining critically poor environmental performance. Through comprehensive multi-method analysis, we demonstrate that Indonesia's HDI-EPI gap represents more than statistical anomaly – it reflects systematic challenges in balancing development priorities that have profound implications for sustainable development theory and human resource management practice.

The finding that Indonesia ranks 113th globally in HDI but 163rd in EPI, with a 21.3% environmental performance deficit relative to ASEAN peers compared to only 7.7% human development deficit, confirms that development trade-offs create distinct challenges requiring specialized approaches. Traditional sustainable development assumptions about positive HDI-EPI correlations, while valid globally ($r = 0.897$), do not adequately account for country-specific contexts where institutional choices, policy priorities, and development strategies create divergent outcomes.

The identification of six distinct country clusters, particularly the "Double Challenge" category encompassing Indonesia, Vietnam, and India, contributes theoretical insights into development typologies that move beyond simple categorizations to reveal systematic patterns requiring differentiated policy approaches. Estonia's exceptional environmental performance despite moderate development level demonstrates alternative pathways that prioritize environmental outcomes, providing benchmarks for countries seeking to escape the "Double Challenge" trap.

For human resource management theory and practice, the study's implications are profound. Organizations operating in contexts characterized by HDI-EPI paradoxes cannot rely on traditional HRM approaches that treat human development and environmental performance as separate domains. Instead, they require integrated frameworks that simultaneously build human capabilities and environmental competencies through green skills development, sustainable leadership formation, environmental behavior change initiatives, and people-planet performance measurement systems.

The efficiency analysis provides optimism by demonstrating that environmental improvements are achievable within existing resource constraints through better allocation and strategic focus. Indonesia's moderate efficiency ranking suggests that the primary barriers to environmental improvement involve policy choices and institutional priorities rather than absolute resource limitations. This finding has important implications for organizational strategy, suggesting that companies can pursue environmental improvements without sacrificing human development outcomes through integrated approaches that address both dimensions simultaneously.

The study contributes methodologically by demonstrating the value of multi-method approaches for understanding complex development phenomena. The sequential application of correlation, cluster, regression, comparative, and efficiency analyses provides comprehensive insights that would be unavailable through single-method approaches. This methodological framework has broader applicability for development research and organizational analysis in complex contexts.

Future research should expand this framework through longitudinal analysis to examine how HDI-EPI relationships evolve over time, organizational-level studies to understand how companies navigate sustainability transitions, and intervention research to test the effectiveness of integrated HRM approaches in "Double Challenge" contexts. The urgency of global sustainability challenges, combined with the growing recognition that human development and environmental protection must be pursued simultaneously rather than sequentially, makes this research agenda both theoretically important and practically essential.

Indonesia's HDI-EPI paradox ultimately represents both a warning and an opportunity. The warning concerns the sustainability risks of development strategies that prioritize human outcomes at environmental expense. The opportunity lies in demonstrating that alternative approaches are possible, as evidenced by countries achieving sustainable development across both dimensions. For organizations, policymakers, and development practitioners, the challenge is translating these insights into actionable strategies that can transform "Double Challenge" contexts into sustainable development success stories.

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