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Green Drivers of Sustainability Performance under Ambidextrous Leadership

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ABSTRACT

Indonesian listed firms continue to face a gap between formal sustainability disclosure and substantive economic, social, and environmental performance. This study examines the statistical relationships of green intellectual capital, stakeholder pressure, and green entrepreneurial orientation with sustainability performance and tests the moderating role of ambidextrous leadership. It also compares an expanded five-dimensional green intellectual capital model, incorporating environmental consciousness and corporate social responsibility, with the conventional three-dimensional model. A cross-sectional survey of 432 chief operating officers and operations managers from non-financial companies listed on the Indonesia Stock Exchange was analyzed using partial least squares structural equation modeling. All three predictors were positively associated with sustainability performance, with green intellectual capital showing the strongest association. Higher ambidextrous leadership was associated with stronger predictor-performance relationships and with sustainability performance directly, supporting a quasi-moderating pattern. The expanded green intellectual capital model showed higher explanatory and predictive power than the conventional model. Given the cross-sectional design, these results are interpreted as associations and moderation patterns, not as evidence of causal transformation.

INTRODUCTION

The intersection of environmental imperatives and corporate strategy has positioned sustainability performance as one of the defining challenges of contemporary management. Across both developed and emerging economies, firms are increasingly expected to

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demonstrate not only financial viability but also measurable environmental and social responsibility. This expectation has intensified in Indonesia, where regulatory developments—most notably the Financial Services Authority Regulation (POJK) No. 51/2017—have mandated sustainability reporting for capital market participants. Despite this regulatory impetus, a persistent performance gap remains: many publicly listed Indonesian companies continue to report sustainability metrics that fall short of international benchmarks, suggesting that compliance-driven disclosure does not automatically translate into genuine operational sustainability. This concern is consistent with recent MIRSHuS evidence that Indonesia's sustainability-oriented industrial strategies must balance economic gains with environmental risks, social conflicts, and governance challenges (Rohmatika & Paksi, 2026).

Understanding this gap requires moving beyond surface-level explanations toward a systematic examination of the organizational resources, external forces, and strategic orientations associated with substantive sustainability outcomes. Three categories of variables stand out as theoretically and practically relevant. First, Green Intellectual Capital (GIC)—encompassing environmental knowledge, structural systems, and relational networks—represents an internal resource endowment theoretically associated with environmental and social performance. Second, Stakeholder Pressure (STP), arising from government regulations, supply chain demands, civil society advocacy, and customer expectations, constitutes the external institutional environment within which sustainability strategies are formed. Third, Green Entrepreneurial Orientation (GEO), reflecting a firm's propensity to pursue green innovation, take calculated environmental risks, and proactively exploit sustainability-related opportunities, captures a strategic disposition expected to be positively related to sustainability performance.

Although each of these variables has attracted scholarly attention individually, their simultaneous examination in an integrated model—particularly within the Indonesian listed company context—remains limited. Moreover, the boundary conditions that shape the effectiveness of these predictors are rarely theorized with precision. This study argues that leadership represents such a boundary condition, and specifically that Ambidextrous Leadership (AL)—the capacity to simultaneously employ opening behaviors that encourage exploration and closing behaviors that enforce disciplined implementation—moderates the relationship between GIC, STP, and GEO on one hand and sustainability performance on the other.

Two theoretical frameworks anchor this inquiry. The Natural Resource-Based View (NRBV), advanced by Hart (1995) and subsequently extended by Hart and Dowell (2010), holds that firms achieve competitive advantage through distinctive environmental capabilities—pollution prevention, product stewardship, and clean technology—embedded in organizational resources and routines. This perspective provides the conceptual basis for expecting a positive GIC–sustainability performance relationship. Institutional Theory, as elaborated by DiMaggio and Powell (1983), offers a complementary lens for understanding how coercive, mimetic, and normative pressures are related to organizational conformity with sustainability expectations. This theory grounds the hypothesized positive relationship between STP and sustainability performance.

At least three research gaps motivate the present study. First, extant GIC research has predominantly relied on a three-dimensional measurement model comprising Green Human

Capital, Green Structural Capital, and Green Relational Capital (Yusliza et al., 2020). This operationalization overlooks Environmental Consciousness—the degree to which organizational members are aware of and committed to environmental values (Astuti & Datrini, 2021; Laheri et al., 2024)—and Corporate Social Responsibility (CSR) as a dimension of organizational-level green capital (Sudibyo & Sutanto, 2020; Porter & Kramer, 2011). Excluding these dimensions potentially truncates the explanatory power of the GIC construct. Second, Ambidextrous Leadership has been studied predominantly as an independent predictor or mediating variable (Lyu et al., 2022; Katou et al., 2023), with little attention to its role as a moderator that conditions the impact of other organizational attributes on performance. Third, the integrated examination of GIC, STP, and GEO within a single moderated framework has not been conducted in the Indonesian listed company context, leaving a gap in the emerging market sustainability literature.

To address these gaps, this study aims to examine: (1) whether Green Intellectual Capital (GIC), Stakeholder Pressure (STP), and Green Entrepreneurial Orientation (GEO) are positively associated with Sustainability Performance (SP) among non-financial companies listed on the Indonesia Stock Exchange; (2) whether Ambidextrous Leadership (AL) is associated with stronger GIC–SP, STP–SP, and GEO–SP relationships; (3) whether the expanded five-dimensional GIC model explains and predicts SP better than the traditional three-dimensional model; and (4) which GIC dimension shows the strongest statistical association with SP. The intended findings are evidence of positive direct associations, significant positive interaction terms, superior explanatory and predictive performance of the expanded GIC measurement, and a ranked comparison of the five GIC dimensions. These outcomes are intended to identify the strongest statistical predictor of SP, classify AL as a quasi-moderating condition, and assess whether Environmental Consciousness and Corporate Social Responsibility provide incremental value beyond Green Human, Structural, and Relational Capital.

The study makes three principal contributions. Theoretically, it extends NRBV by introducing Environmental Consciousness and CSR as legitimated dimensions of GIC, and advances Institutional Theory by specifying leadership as a contingency condition for the institutional pressure–response relationship. Methodologically, it validates a five-dimension GIC measurement model through rigorous SEM-PLS estimation and comparative sensitivity testing. Practically, the findings offer guidance to executives considering configurations of green knowledge resources and leadership approaches associated with stronger sustainability performance, and to regulators considering the design of sustainability disclosure and governance mandates.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Theoretical Foundations

The Natural Resource-Based View of the firm (Hart, 1995) builds on Barney (1991) Resource-Based View by explicitly incorporating natural environment constraints into the theory of competitive advantage. Whereas the RBV identifies valuable, rare, inimitable, and non-substitutable resources as the basis of sustained competitive advantage, the NRBV argues that the most strategically significant resources are those that enable firms to manage their environmental footprint proactively. Three interconnected strategic capabilities—pollution prevention, product stewardship, and clean technology—constitute the core of NRBV-based

competitive advantage, each building on unique organizational learning and knowledge assets. Hart and Dowell (2010) subsequently refined this framework, demonstrating that environmental capabilities contribute to both cost reduction and market differentiation, particularly as ecological constraints tighten globally.

Institutional Theory (DiMaggio & Powell, 1983) examines how organizations respond to external pressures through three isomorphic mechanisms. Coercive isomorphism arises from legal requirements, regulatory mandates, and expectations imposed by powerful constituents such as government agencies and dominant customers. Mimetic isomorphism emerges when firms emulate the practices of successful or prominent peers in conditions of uncertainty. Normative isomorphism derives from professional networks, industry associations, and educational institutions that propagate standards of responsible conduct. In the sustainability domain, these three mechanisms collectively push firms toward the adoption of environmental management practices, independent of whether those practices are intrinsically motivated or instrumentally imposed. Freeman et al. (2010) and Mitchell et al. (1997) further elaborate how stakeholder salience and power dynamics shape the prioritization of sustainability responses within the institutional environment.

2.2 Green Intellectual Capital

Intellectual capital, broadly understood as the sum of knowledge-based assets that create organizational value, has been operationalized in the sustainability context as Green Intellectual Capital—the collection of environmental knowledge, systems, and relationships that enable firms to pursue environmental objectives effectively (Chen, 2008). The traditional measurement framework proposed by Yusliza et al. (2020) disaggregates GIC into Green Human Capital (the environmental knowledge, competencies, and values of employees), Green Structural Capital (the organizational processes, routines, and information systems that institutionalize environmental practices), and Green Relational Capital (the environmental cooperation, trust, and partnerships with external stakeholders including suppliers, customers, and community groups).

This study argues that the three-dimension model, while foundational, is incomplete. Environmental Consciousness (EC) refers to the extent to which an organization's culture, values, and cognitive orientation prioritize environmental stewardship (Astuti & Datrini, 2021). Unlike Green Human Capital, which captures individual-level knowledge, EC denotes an organization-wide perceptual orientation that shapes how environmental issues are interpreted, prioritized, and acted upon. Laheri et al. (2024) demonstrate that EC mediates the relationship between GIC and sustainable competitive advantage, indicating its distinct conceptual contribution beyond what the three traditional dimensions capture. Corporate Social Responsibility, as the fifth dimension, captures the firm's commitment to balancing economic, social, and environmental objectives in a manner consistent with stakeholder expectations (Sudibyo & Sutanto, 2020). Porter and Kramer (2011) argue that strategically embedded CSR creates shared value for both the firm and society, making it a source of long-term competitive advantage that aligns naturally with the NRBV logic. Including CSR as a GIC dimension reflects the growing recognition that sustainability is not merely an environmental phenomenon but one with deep social dimensions that together constitute holistic organizational green capital.

2.3 Hypothesis 1: Green Intellectual Capital and Sustainability Performance

Drawing on the NRBV, firms with richer and more diversified GIC endowments are better positioned to develop and deploy the environmental capabilities required for superior sustainability performance. GIC facilitates pollution prevention through informed environmental practices, supports product stewardship through relational knowledge with supply chain partners and customers, and enables clean technology development through structural and human capital investments. The empirical literature provides consistent support: Yusliza et al. (2020) find positive GIC–performance relationships in Malaysian listed firms, and Rundengan and Tjahjadi (2023) confirm this pattern in the Indonesian manufacturing sector. While Yusoff et al. (2019) and Kumar et al. (2025) report mixed or context-dependent effects, the weight of evidence supports a positive relationship. The five-dimension GIC model developed here is expected to exhibit stronger predictive power by capturing the full breadth of an organization's green knowledge assets.

H1: Green Intellectual Capital is positively associated with Sustainability Performance.

2.4 Hypothesis 2: Stakeholder Pressure and Sustainability Performance

Institutional Theory predicts that organizations subject to stronger coercive, mimetic, and normative pressures will be more likely to adopt sustainability practices associated with measurable performance differences. Government environmental regulations create coercive pressures through compliance requirements and incentives; supply chain demands from international buyers create mimetic pressures through market-access standards; and industry associations and civil society organizations generate normative pressures by propagating sustainability expectations. Awonaike and Atan (2025) and Karikari Appiah et al. (2022) report positive STP–performance relationships, while Tian and Tian (2021) report a particularly strong association for coercive government pressure in comparable institutional contexts. Although Yadegaridehkordi et al. (2023) found stakeholder pressure significant primarily for social performance, the multidimensional STP measure used here captures pressure from several stakeholder domains.

H2: Stakeholder Pressure is positively associated with Sustainability Performance.

2.5 Hypothesis 3: Green Entrepreneurial Orientation and Sustainability Performance

Green Entrepreneurial Orientation represents a strategic disposition that integrates environmental responsibility into the core dimensions of entrepreneurial posture: innovation, proactiveness, risk-taking, competitive aggressiveness, and autonomy. Coelho et al. (2024) report a positive GEO–sustainable performance relationship through green innovation and green market orientation pathways. Habib et al. (2021) and Ye et al. (2022) similarly report positive GEO–performance relationships in manufacturing and export-oriented firm contexts, while Tze San et al. (2022) extend this pattern to Malaysian SMEs. From an NRBV perspective, GEO is theoretically consistent with mobilizing latent environmental capabilities into active competitive strategies and with stronger sustainability performance.

H3: Green Entrepreneurial Orientation is positively associated with Sustainability Performance.

2.6 Ambidextrous Leadership as Moderator

Ambidextrous Leadership, as theorized by Rosing et al. (2011), is defined by the flexible alternation between two complementary behavioral sets. Opening behaviors—including encouraging experimentation, tolerating mistakes, permitting independent thinking, and supporting creative deviation from established practice—create the organizational conditions for exploration, learning, and innovation. Closing behaviors—including setting structured goals, monitoring progress, enforcing timelines, and sanctioning non-compliance with performance standards—create the conditions for efficient exploitation of proven practices. The capacity to apply these behaviors contextually rather than exclusively distinguishes ambidextrous leaders from those who optimize for either exploration or exploitation alone. Smith and Lewis (2011) theorize ambidexterity as a paradox management capability, and Hahn et al. (2018) connect paradox theory explicitly to corporate sustainability, where organizations must simultaneously manage economic efficiency (exploitation) and environmental transformation (exploration). Schaltegger and Wagner (2011) further ground this tension in sustainability entrepreneurship, where both innovative initiative and systematic execution are indispensable.

Hypotheses H4, H5, and H6 collectively propose that Ambidextrous Leadership moderates the relationships between GIC, STP, GEO and sustainability performance respectively. The NRBV logic for H4 is that leadership capability may condition how GIC is orchestrated and deployed: opening behaviors are theorized to support innovative applications of GIC, while closing behaviors are theorized to support their systematic embedding in organizational routines and operating procedures. For H5, Institutional Theory suggests that the STP–performance relationship may vary across leadership conditions; leadership may be relevant to how pressures are interpreted and addressed, although these internal processes are not directly tested here. For H6, GEO initiatives may be more strongly associated with sustainability performance under leadership conditions that support both experimentation and disciplined implementation.

H4: Ambidextrous Leadership moderates the positive relationship between GIC and Sustainability Performance, such that the relationship is stronger when AL is higher.

H5: Ambidextrous Leadership moderates the positive relationship between STP and Sustainability Performance, such that the relationship is stronger when AL is higher.

H6: Ambidextrous Leadership moderates the positive relationship between GEO and Sustainability Performance, such that the relationship is stronger when AL is higher.

2.7 Conceptual Framework

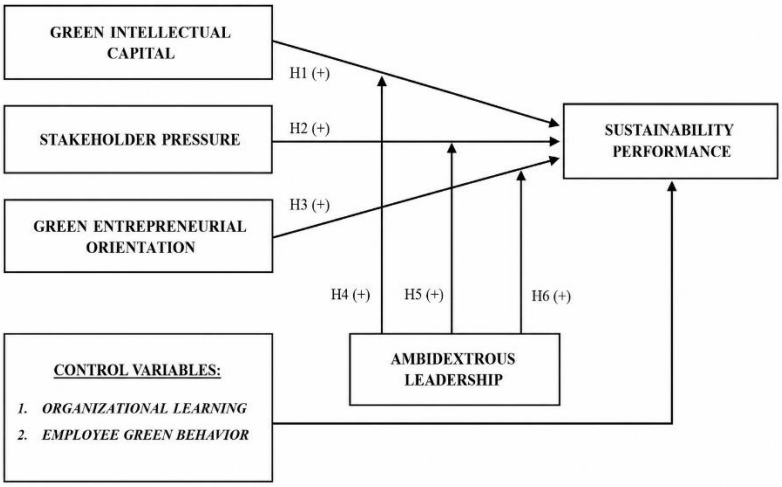

Figure 1 presents the conceptual framework of this study. The framework depicts three direct relationships: GIC, STP, and GEO are each hypothesized to be positively associated with Sustainability Performance. Ambidextrous Leadership is positioned as a quasi-moderating variable, generating multiplicative interaction terms with each of the three predictors. Control variables—Organizational Learning (OL) and Employee Green Behavior (EGB)—are included to partial out alternative explanations for sustainability performance variation. The framework integrates NRBV logic for the internal resource relationship (GIC) and Institutional Theory for the external pressure relationship (STP), while drawing on paradox theory and entrepreneurship theory to underpin the GEO and AL propositions, respectively.

METHOD

3.1 Research Design and Sampling

This study adopts a quantitative, cross-sectional survey design. The target population consists of non-financial companies listed on the Indonesia Stock Exchange (IDX). Financial companies were excluded due to their distinct regulatory environment and reporting obligations, which would introduce systematic heterogeneity into the sample. Purposive sampling was employed to identify respondents with direct knowledge of organizational sustainability practices and strategic decision-making processes: specifically, Chief Operating Officers (COO) and Operations Managers from the target population. This senior management focus is theoretically grounded in the view that sustainability performance is closely linked to strategic choices and resource allocation decisions made at the top management level.

A total of 432 complete and usable questionnaire responses were obtained. This sample size substantially exceeds the minimum requirements for SEM-PLS estimation as recommended by Hair et al. (2021) and provides adequate statistical power for detecting moderation effects (Cohen, 1988). Survey instruments were administered in Indonesian and English, with back-translation procedures employed to ensure linguistic equivalence. Data collection was conducted over a six-month period following receipt of institutional ethics approval. No significant non-response bias was detected through wave analysis comparing early and late respondents across key study variables.

3.2 Measurement Instruments

All constructs were measured using reflective multi-item scales anchored on a 6-point Likert format ranging from 1 (strongly disagree) to 6 (strongly agree). A 6-point scale was deliberately chosen over the conventional 5-point format to eliminate the central tendency bias introduced by a neutral midpoint, thereby increasing discriminatory power across the response distribution (Chyung et al., 2017).

Based on this calculation method, the specific indicators and measurement sources for all study variables are summarized in Table 1.

Table 1: Operational Definitions of Variables

Variable	Definition	Indicators / Dimensions	Scale / Source
Green Intellectual Capital (GIC)	The overall organizational knowledge, capabilities, and competencies related to environmental management and sustainability.	Twenty-eight items across five dimensions: 1. Green Human Capital (5): employee contribution, competence, green product/service quality, teamwork, and managerial support. 2. Green Structural Capital (9): environmental management system, innovation, benefits, R&D intensity, environmental personnel, facilities, green product development, operations, and knowledge management. 3. Green Relational Capital (5): customer green design, customer satisfaction, supplier cooperation, distribution-channel cooperation, and strategic partner cooperation. 4. Environmental Consciousness (4): managerial responsibility, employee understanding of policies/regulations, managerial environmental knowledge, and organizational environmental awareness. 5. Corporate Social Responsibility (5): fair employment, safe services, community welfare mission, community resource contribution, and employee volunteering.	Likert scale Yusliza et al. (2020); Astuti & Datrini (2021); Laheri et al. (2024); Shah et al. (2023); Sudibyo & Sutanto (2020); Ledi et al. (2023)
Stakeholder Pressure (STP)	The influence and demands of various stakeholder groups that encourage organizations to adopt sustainable business practices.	Four items covering demands from: 1. Environmental groups/organizations. 2. Customers. 3. Government/regulators. 4. 4. Supply-chain and business partners.	Likert scale Awonaike & Atan (2025)
Green Entrepreneurial Orientation (GEO)	The strategic tendency of an organization to integrate environmental considerations into	Five items covering: 1. Green practices, R&D, technological leadership, and innovation. 2. Proactive pursuit of green opportunities.	Likert scale Asad et al. (2023)

	entrepreneurial behavior.	3. Initiation of green actions followed by competitors. 4. First-mover orientation in green products, services, or technologies. 5. Competitive strategy to outperform rivals in green initiatives.	
Ambidextrous Leadership (AL)	The ability of leaders to simultaneously manage and balance exploration and exploitation activities within the organization.	Eight items across two dimensions: 1. Opening Leadership (3): accommodating diverse ideas, encouraging teamwork, and supporting team learning. 2. Closing Leadership (5): monitoring/evaluation, rule compliance, consistency with plans, corrective action, and task completion.	Likert scale Indrianti et al. (2024)
Organizational Learning (OL)	A dynamic process through which organizations acquire, disseminate, interpret, and integrate new knowledge.	Thirteen items across four dimensions: 1. Knowledge Acquisition (4): external professional knowledge, exhibition learning, R&D policy, and testing new work-performance ideas. 2. Knowledge Dissemination (4): sharing meetings, best-practice mechanisms, cross-unit liaison roles, and idea collection/distribution staff. 3. Knowledge Interpretation (3): goal understanding, informal business-experience sharing, and teamwork across units. 4. Knowledge Storage (2): information retrieval systems and coding for knowledge storage.	Likert scale Lwanga et al. (2023)
Employee Green Behavior (EGB)	Voluntary or required employee actions undertaken to support organizational sustainability goals.	Thirteen items across four dimensions: 1. Green Learning (3): following environmental initiatives, joining environmental training, and self-learning on environmental protection. 2. Individual Green Practice (4): double-sided printing, reusable cups, green task completion, and green job-duty performance. 3. Influencing Others (2): helping and encouraging coworkers to act more environmentally. 4. Organizational Voices (4): encouraging environmental ideas, suggesting green practices to management, highlighting non-green activities, and reporting environmentally irresponsible practices.	Likert scale Zhang et al. (2021)

Sustainability Performance (SP)	The evaluation and measurement of an organization's environmental, social, and economic impacts to support sustainable development through targets, initiatives, monitoring, and strategic adjustment.	Thirteen items across three dimensions: 1. Economic Performance (5): ROI, sales growth, profit growth, market share, and turnover ratio. 2. Social Performance (4): employee satisfaction, work motivation, occupational health and safety, and education/training. 3. Environmental Performance (4): raw-material efficiency, reduced resource consumption, recycled-material percentage, and reduced waste ratio.	Likert scale Cheng et al. (2023)

3.3 Analytical Procedure

Data were analyzed using SEM-PLS implemented in SmartPLS 4. SEM-PLS was selected over covariance-based SEM for three reasons: it does not require multivariate normality, it is appropriate for exploratory and predictive research objectives, and it accommodates complex models with multiple latent variables and interaction terms (Hair et al., 2021). The general structural equation estimated is:

$$SP = \beta_0 + \beta_1 GIC + \beta_2 STP + \beta_3 GEO + \beta_4 (AL \times GIC) + \beta_5 (AL \times STP) + \beta_6 (AL \times GEO) + \beta_7 OL + \beta_8 EGB + \varepsilon$$

Moderation effects were estimated using the product indicator approach, with interactions operationalized as element-wise products of standardized indicator scores. Moderator classification followed the framework of Sharma et al. (1981), which distinguishes pure moderators (uncorrelated with criterion and predictor), quasi-moderators (correlated with at least one of these), and homologizers (affecting only the predictor-criterion relationship strength without direct effects). The analytical sequence comprised: (1) evaluation of the outer measurement model through convergent validity (AVE), discriminant validity (Fornell & Larcker, 1981; HTMT ratio, Henseler et al., 2015), and internal consistency; (2) evaluation of the inner structural model through R^2, Q^2, SRMR, and NFI; and (3) hypothesis testing via bootstrapping with 10,000 subsamples. Sensitivity testing compared the main five-dimension GIC model against the traditional three-dimension specification. Expansion testing decomposed GIC into its five constituent dimensions as individual predictors to assess each dimension's independent statistical association with SP.

RESULT AND DISCUSSION

Sample Description

The final analytical sample of 432 respondents comprised COO and Operations Managers drawn from non-financial IDX-listed companies spanning manufacturing, consumer goods, infrastructure, trade, and services sectors. The majority of respondents hold postgraduate qualifications and report more than ten years of experience in operations management roles. This respondent profile is appropriate given the theoretical requirement that informants possess direct knowledge of strategic sustainability decisions and organizational resource configurations, as the study's constructs—particularly GIC and AL—are most accurately assessed by senior executives with both strategic and operational visibility.

Measurement Model Assessment

Convergent validity was assessed through Average Variance Extracted (AVE). All constructs except the composite GIC construct in the five-dimension model recorded AVE values exceeding the conventional 0.50 threshold. The five-dimension GIC composite yielded an AVE of 0.411, which falls marginally below the threshold; this is expected and theoretically defensible given the multidimensional complexity of the GIC construct and the breadth of heterogeneous content domains captured across five distinct dimensions. All individual GIC sub-dimensions recorded adequate AVE values when assessed independently. Composite Reliability and Cronbach's Alpha exceeded 0.70 for all constructs, with Sustainability Performance recording the highest reliability (Composite Reliability = 0.994, Cronbach's Alpha = 0.993), indicating exceptional internal consistency across its 13 indicators.

Discriminant validity was evaluated through the Fornell-Larcker criterion (Fornell & Larcker, 1981) and the Heterotrait-Monotrait (HTMT) ratio (Henseler et al., 2015). The square root of each construct's AVE exceeded its inter-construct correlations, satisfying the Fornell-Larcker criterion. HTMT ratios remained below the conservative 0.85 threshold for all construct pairs, with the sole exception of closely related sub-dimensions of the GIC construct, where values remained below the more liberal 0.90 threshold applicable to conceptually related dimensions. These results collectively confirm adequate discriminant validity across all constructs.

Structural Model Assessment

The structural model achieved $R^2 = 0.933$ (Adjusted $R^2 = 0.932$), indicating that the predictor set explains approximately 93 percent of variance in Sustainability Performance—a level classified as strong by established benchmarks (Hair et al., 2021). Predictive relevance, assessed via the PLSpredict procedure, yielded $Q^2predict = 0.909$, confirming high out-of-sample predictive accuracy. Model fit was evaluated through SRMR = 0.034, which falls well below the 0.08 acceptable threshold, indicating good model-data correspondence. The NFI of 0.790 exceeds the 0.70 acceptability threshold. Effect sizes (Cohen's f^2) ranged from very large for GIC through large for AL to medium for STP and small-to-medium for GEO, indicating substantively meaningful contributions across the predictor set.

Hypothesis Testing

Table 2. Hypothesis Testing Results - Direct and Moderation Relationships

Hypothesis	Path	Dir. Pred.	Coefficient (β)	t-statistic	p-value	Decision
H1	GIC → SP	(+)	0.407	19.312	<0.001***	Supported
H2	STP → SP	(+)	0.134	7.166	<0.001***	Supported
H3	GEO → SP	(+)	0.103	6.239	<0.001***	Supported
H4	AL×GIC → SP	(+)	0.130	7.082	<0.001***	Supported
H5	AL×STP → SP	(+)	0.042	2.452	0.007**	Supported
H6	AL×GEO → SP	(+)	0.030	2.037	0.021**	Supported
—	AL → SP (direct)	(+)	0.386	16.639	<0.001***	Significant
—	OL → SP (control)	(+)	0.069	4.104	<0.001***	Significant
—	EGB → SP (control)	(+)	0.078	4.562	<0.001***	Significant

*Notes: ***p < 0.001, **p < 0.05. SP = Sustainability Performance. Regression equation: SP = β_0 + β_1GIC + β_2STP + β_3GEO + β_4(AL×GIC) + β_5(AL×STP) + β_6(AL×GEO) + β_7OL + β_8EGB + ε. Bootstrapped t-statistics based on 10,000 resamples.*

4.5 Sensitivity Test Results

Table 3. Sensitivity Test: Five-Dimension vs. Three-Dimension GIC Model

Criterion	Main Model (5-Dim GIC)	Sensitivity Model (3-Dim GIC)
R^2	0.933	0.919
Adjusted R^2	0.932	0.917
Q^2predict	0.909	0.893
SRMR	0.034	0.031
NFI	0.790	0.796
GIC → SP (β)	0.407***	0.421***
STP → SP (β)	0.134***	0.128***
GEO → SP (β)	0.103***	0.098***
AL×GIC → SP (β)	0.130***	0.125***
AL×STP → SP (β)	0.042**	0.040**
AL×GEO → SP (β)	0.030**	0.028*
f^2 GIC	0.852	0.701
f^2 AL	0.583	0.643

*Notes: ***p < 0.001, **p < 0.05, *p < 0.10. All hypotheses remain consistent in direction and significance across both models. The five-dimension model demonstrates superior R^2, Adjusted R^2, and Q^2predict, supporting the expanded GIC operationalization.*

4.6 Expansion Test Results

Table 3. Expansion Test: Statistical Associations of Individual GIC Dimensions with Sustainability Performance

Variable	Coefficient (β)	Z-statistic	f^2	Rank
Green Structural Capital	0.326	14.85***	0.282	1
Green Relational Capital	0.289	13.54***	0.215	2
Green Human Capital	0.276	12.98***	0.205	3
Corporate Social Responsibility	0.241	11.25***	0.159	4
Environmental Consciousness	0.187	8.62***	0.094	5
STP	0.125	6.83***	—	—
GEO	0.098	5.74***	—	—
OL (control)	0.112	6.52***	0.126	—
EGB (control)	0.109	6.39***	0.120	—

*Notes: ***p < 0.001. Adj. R^2 = 0.840; NFI = 0.926. Regression: SP = β_0 + β_1GHC + β_2GSC + β_3GRC + β_4EC + β_5CSR + β_6STP + β_7GEO + β_8OL + β_9EGB + ε. Z-statistics from bootstrapped estimation.*

Discussion

Green Intellectual Capital and Sustainability Performance

GIC emerged as the most influential statistical predictor of sustainability performance in this study, consistent with the NRBV expectation that environmental knowledge resources

are associated with sustainable competitive advantage. The breadth and depth of green knowledge embedded in an organization's human resources, structural systems, relational networks, environmental consciousness, and social responsibility commitments are positively associated with sustainability performance and are theoretically consistent with more developed environmental management practices. This pattern is consistent with Yusliza et al. (2020), who report a robust positive GIC–performance relationship in Malaysian public listed companies, and with Rundengan and Tjahjadi (2023), who report a similar pattern among Indonesian manufacturing firms.

What distinguishes the present study is the richer theoretical elaboration provided by the five-dimension GIC model. The traditional three-dimension framework, while useful, treats GIC as a phenomenon bounded by individual competencies, organizational routines, and external partnerships. The incorporation of Environmental Consciousness acknowledges that an organization's collective perceptual orientation toward environmental values may be associated with how green information is interpreted and how sustainability challenges are prioritized at the organizational level. The inclusion of CSR recognizes that sustainability performance is not reducible to environmental management alone but encompasses a social legitimacy dimension that reflects stakeholder expectations about responsible business conduct and community engagement.

This study's findings contrast with Yusoff et al. (2019), who found Green Human Capital insignificant in the hotel industry context. A possible contextual explanation concerns the different respondent profile in the present study: senior managers with decision-making authority and strategic environmental management experience could plausibly relate human-capital resources to performance-relevant strategic decisions differently from operational-level employees in service settings. However, respondent role was not tested as an explanatory mechanism, so this interpretation is not a finding of the present study and should be treated as a hypothesis for future research. Similarly, the contrast with Kumar et al. (2025)—who reported a negative relationship for Green Relational Capital in competitive market contexts—may reflect contextual differences. Relationship-oriented features sometimes associated with Indonesian business settings could be relevant to collaborative sustainability practices, but national culture was not measured in this study. Accordingly, this explanation is tentative and should be treated only as a possible contextual interpretation requiring direct empirical testing.

Stakeholder Pressure and Sustainability Performance

Stakeholder pressure was positively and significantly associated with sustainability performance, supporting H2 and remaining consistent with Institutional Theory. Coercive, mimetic, and normative forces therefore provide a theoretical lens for interpreting why stronger external expectations may coincide with more substantive sustainability responses; the cross-sectional data do not establish that stakeholder pressure causes or transforms organizational behavior. In the Indonesian context, the measured pressure sources include government regulatory requirements, multinational buyer standards in global supply chains, civil-society scrutiny, and customer expectations. These contextual features describe the institutional setting of the sample rather than tested causal mechanisms.

This result is consistent with the findings of Awonaike and Atan (2025), whose meta-analytic review reports a broad positive relationship between stakeholder pressure and

sustainability outcomes, and Karikari Appiah et al. (2022), who identify strategic response capability as a potential mechanism in this relationship. The broader association observed here extends beyond the partial associations reported by Yadegaridehkordi et al. (2023), who found STP significant only for social performance dimensions. One possible explanation is the integrated multidimensional nature of stakeholder pressure measurement in this study, which simultaneously captures government, supply chain, civil society, and customer dimensions. Because the study did not experimentally compare alternative STP operationalizations, this explanation should be viewed as a measurement-based interpretation rather than a tested source of between-study differences.

Green Entrepreneurial Orientation and Sustainability Performance

The positive association between GEO and sustainability performance supports H3 and is consistent with the proposition that a strategic disposition toward green innovation, proactive environmental opportunity-seeking, calculated sustainability risk-taking, competitive aggressiveness in green markets, and employee autonomy in environmental initiatives is statistically related to higher economic, social, and environmental performance. This finding is consistent with Coelho et al. (2024), who report positive GEO–sustainability relationships through green innovation and green market orientation pathways, and with Habib et al. (2021) and Ye et al. (2022), who likewise report positive GEO–performance relationships in manufacturing contexts across different national settings.

The present finding may be relevant to Indonesia's development trajectory. The country's 2025–2045 National Long-Term Development Plan envisions a transition to a green economy, creating institutional space—and eventually regulatory expectation—for environmentally oriented entrepreneurial strategies. Firms with higher GEO may therefore be better positioned to pursue green market opportunities and respond to rising institutional expectations, a pattern consistent with the NRBV proposition that proactive environmental capability development can be associated with first-mover advantages. The observed configuration across GEO dimensions is consistent with, but does not establish, the possibility that Indonesian listed firms are developing multifaceted entrepreneurial sustainability orientations rather than isolated green initiatives.

Ambidextrous Leadership Moderating GIC–SP

The positive AL×GIC interaction indicates that the GIC–SP association is stronger at higher levels of Ambidextrous Leadership, supporting H4. This pattern is consistent with the theoretical proposition that ambidextrous leadership may function as an orchestrating condition under which organizational green knowledge is more strongly related to sustainability capabilities. The interaction does not establish that AL transforms GIC into environmental capability; it shows statistically that AL conditions the strength of the GIC–SP relationship. Organizations with comparable GIC levels may therefore display different sustainability performance levels across AL conditions, but the cross-sectional design cannot establish temporal ordering or the causal mechanism underlying this pattern.

This result is consistent with paradox theory (Smith & Lewis, 2011) and its application to corporate sustainability by Hahn et al. (2018), which emphasizes the simultaneous management of exploration and exploitation. From this theoretical perspective, opening behaviors may support the creative application of GIC to novel environmental challenges,

while closing behaviors may support the routinization and scaling of successful green knowledge applications. The observed interaction pattern is therefore consistent with a synergistic relationship in which the positive GIC–SP association is stronger when leadership is more ambidextrous, rather than evidence of a directly observed causal conversion process.

Ambidextrous Leadership Moderating STP–SP

The positive AL×STP interaction indicates that the STP–SP association is stronger at higher levels of Ambidextrous Leadership, supporting H5. This pattern is consistent with the theoretical possibility that ambidextrous leadership is a boundary condition for the stakeholder pressure–performance relationship. The study did not directly measure symbolic compliance, greenwashing, or the internal process through which stakeholder demands are interpreted. Accordingly, the result should not be interpreted as evidence that lower AL causes compliance-oriented responses or that higher AL transforms stakeholder pressure into sustainability outcomes. These mechanisms remain plausible propositions for longitudinal or process-based testing.

Viewed against Yadegaridehkordi et al. (2023), the current finding offers one possible perspective rather than a causal resolution. Their observation that STP is significant primarily for social performance may be related to differences in model specification, context, measurement, or unobserved boundary conditions, including leadership. In the present sample, the significant AL×STP term shows that the positive association between STP and overall sustainability performance is stronger when AL is higher. It does not establish that AL transforms external pressure into comprehensive performance improvements or explain dimension-specific causal pathways.

Ambidextrous Leadership Moderating GEO–SP

Although the moderation of the GEO–SP relationship by AL is the smallest among the three moderation effects tested, it remains statistically significant and theoretically meaningful. Green entrepreneurial initiatives are often associated with innovation projects that require both freedom to experiment and structural support for implementation and scaling. From a theoretical standpoint, opening leadership behaviors may support autonomy and tolerance for failure, whereas closing behaviors may support goal setting, progress monitoring, implementation, and scaling. The observed interaction is consistent with these complementary roles, but the cross-sectional design does not establish that leadership behaviors cause GEO initiatives to become sustainability outcomes.

The smaller magnitude of this moderation effect relative to those for GIC and STP may have several explanations. One possible, untested explanation is the partially self-structuring nature of entrepreneurially oriented firms: organizations with high GEO may already cultivate internal autonomy and innovation norms that reduce their incremental dependence on leadership scaffolding. However, the study did not directly measure internal self-structuring processes or dependence on leadership scaffolding, so this interpretation should be treated as a hypothesis rather than a finding. What the data establish is narrower: higher AL is statistically associated with a modestly stronger GEO–SP relationship in this sample. Future longitudinal or multilevel research could test whether organizational legitimacy, resource allocation authority, or institutionalization processes account for this moderation pattern.

Ambidextrous Leadership as Quasi-Moderator

The classification of Ambidextrous Leadership as a quasi-moderator—following the taxonomy of Sharma et al. (1981)—represents a theoretically significant statistical finding. A quasi-moderator is a variable that has a direct relationship with the criterion variable while also moderating predictor–criterion relationships. In this study, the classification is supported by a significant direct AL–SP path and three significant AL interaction terms. Accordingly, the results identify two statistical roles for AL: a direct association with sustainability performance and conditional associations in which the strengths of the GIC–SP, STP–SP, and GEO–SP relationships vary with AL. These coefficients do not, by themselves, establish two causal mechanisms. Research focusing on only one role would therefore provide a less complete description of how AL is statistically related to sustainability performance in the specified model.

CONCLUSION

This study provides robust empirical evidence that Green Intellectual Capital, Stakeholder Pressure, and Green Entrepreneurial Orientation are each positively and significantly associated with Sustainability Performance among non-financial companies listed on the Indonesia Stock Exchange. The five-dimensional GIC model—which extends the traditional three-dimension framework through the incorporation of Environmental Consciousness and Corporate Social Responsibility—demonstrates superior explanatory and predictive performance relative to the conventional specification, supporting the theoretical argument that organizational green capital encompasses not only knowledge stocks and relational assets but also collective environmental values and social responsibility commitments. Ambidextrous Leadership is classified as a quasi-moderator: significant positive interaction terms indicate that each predictor–performance relationship is stronger at higher AL, while AL also shows a significant positive direct association with sustainability performance. The consistency of these results across sensitivity and expansion tests supports the robustness of the statistical relationships across alternative model specifications. Given the cross-sectional design, these findings should be interpreted as associations and moderation patterns rather than evidence that leadership or the other predictors causally transform, determine, or produce sustainability outcomes.

The study carries several practical and theoretical implications. Organizations seeking to improve sustainability performance may consider prioritizing Green Structural Capital, which showed the strongest statistical contribution among the individual GIC dimensions, while also developing relational, human, environmental consciousness, and social responsibility capital. Leadership development programs may likewise consider cultivating paradox-management capabilities—specifically the ability to balance exploration of new sustainability frontiers with disciplined exploitation of proven environmental practices—because higher AL was associated with stronger GIC–SP, STP–SP, and GEO–SP relationships in this sample. For regulators, particularly Indonesia's Financial Services Authority (OJK), the superior explanatory and predictive performance of the five-dimension GIC model suggests merit in considering integrated sustainability reporting that spans not only environmental management systems but also organizational environmental consciousness and CSR commitments. Academically, the findings are consistent with extending NRBV and Institutional Theory by indicating that the observed predictor–performance relationships vary

with leadership configuration, while not establishing causality. Future research should address the limitations of the cross-sectional design by employing longitudinal or panel data to examine the temporal ordering of GIC, stakeholder pressure, GEO, leadership, and sustainability performance. Configurational approaches, including Qualitative Comparative Analysis (QCA), could identify equifinal pathways to sustainability performance that complement the variable-centered findings of the present study.

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