Determinants of Green Employee Engagement in Non-Formal Education: A Comprehensive Study of Leadership, Culture, and Innovation Effects

Indarta Priyana[1]*, H. M. Sidik Priadana[2], Yusuf Arifin[3]

[1]Manajemen, Universitas Pasundan (UNPAS), Bandung, Indonesia [2]Manajemen, Universitas Pasundan (UNPAS), Bandung, Indonesia
[3]Manajemen, Universitas Pasundan (UNPAS), Bandung, Indonesia

*Corresponding author: indarta.priyana@mail.unpas.ac.id

ABSTRACT

Green Employee Engagement (GEE) has emerged as a critical mechanism through which organizations can achieve environmental sustainability goals, particularly in the non-formal education sector. This study investigates the direct effects of three key organizational determinants—Green Transformational Leadership (GTL), Green Organizational Culture (GOC), and Sustainability-Oriented Innovation (SOI)—on green employee engagement in non-formal educational institutions. Drawing on Social Exchange Theory and the Ability-Motivation-Opportunity (AMO) framework, we analyze data from 258 frontline leaders across PT Ganesha Operation's branch network using Structural Equation Modeling (SEM) with LISREL software. Results reveal that all three variables significantly predict GEE: GTL ($\beta = 0.3209$, $t = 5.7687$, $p < 0.001$), GOC ($\beta = 0.2976$, $t = 3.5139$, $p < 0.001$), and SOI ($\beta = 0.3148$, $t = 4.7973$, $p < 0.001$). The model explains 72.97% of variance in green employee engagement, indicating that an integrated approach combining transformational leadership with cultural alignment and innovation systems is essential for fostering engagement in green work activities. This study extends green HRM and green organizational behavior literature to the underexamined context of non-formal education in developing economies, providing both theoretical insights and practical recommendations for organizational leaders seeking to strengthen environmental performance through employee engagement mechanisms.

Keywords: Green Employee Engagement, Green Transformational Leadership, Green Organizational Culture, Sustainability-Oriented Innovation, Non-formal Education, Developing Economies

1. INTRODUCTION

1.1 Background and Context

Environmental sustainability has emerged as a critical imperative for organizations across all sectors, including education [1]. The non-formal education sector, comprising tutoring organizations, training centers, and community learning initiatives, represents a significant but underexamined context for green organizational behavior research. In Indonesia, non-formal education institutions such as PT Ganesha Operation (a national tutoring organization with over 700 branches) serve millions of students annually and employ thousands of frontline educators and administrators. Despite their substantial workforce and operational reach, these institutions face unique challenges in integrating sustainability practices due to limited resources, decentralized management structures, and competing operational priorities [2].

Green employee engagement (GEE) refers to the psychological connection and active involvement of employees in green work activities, encompassing dimensions of vigor, dedication, and absorption in sustainability-related tasks [1]. Unlike traditional performance metrics, engagement captures the emotional and behavioral commitment that drives sustainable practices from within. Research in developed economy contexts demonstrates that engaged employees are more likely to adopt sustainable practices, participate in environmental initiatives, and contribute innovative green solutions [3].

1.2 Research Gap and Theoretical Positioning

Prior studies have examined green transformational leadership, green organizational culture, and sustainability-oriented innovation as separate constructs influencing organizational outcomes [1]. Furthermore, research on green employee engagement has primarily focused on formal organizations in manufacturing and service sectors, particularly in developed economies [3]. The non-formal education sector in developing economies represents a significant research gap, despite the sector's growing importance for sustainable development and its workforce characteristics distinct from traditional corporate settings.

Additionally, while some studies have established the importance of employee engagement as a mediating mechanism between leadership and performance [1], limited research explicitly examines how multiple organizational determinants—leadership, culture, and innovation—jointly influence engagement as a central outcome rather than a mediator. This study repositions green employee engagement from a mediation role to a direct outcome variable, recognizing that engagement itself represents a critical psychological mechanism for translating organizational systems and leadership into sustainable behaviors.

1.3 Research Objectives and Questions

This study addresses these gaps by examining the direct effects of Green Transformational Leadership (GTL), Green Organizational Culture (GOC), and Sustainability-Oriented Innovation (SOI) on Green Employee Engagement (GEE) in Indonesian non-formal education institutions. Specifically, the research addresses the following questions:

1. To what extent does green transformational leadership (GTL) directly influence green employee engagement (GEE) in non-formal educational institutions?
2. What is the relationship between green organizational culture (GOC) and green employee engagement (GEE)?
3. How does sustainability-oriented innovation (SOI) contribute to green employee engagement (GEE)?
4. What are the relative contributions of these three variables in explaining the variance in green employee engagement?

1.4 Significance of the Study

This research contributes to green HRM and organizational behavior literature in three important ways. First, it extends theoretical understanding of how organizations in resource-constrained, decentralized contexts—characteristic of non-formal education—can foster environmental engagement. Second, it provides empirical evidence from a developing economy context (Indonesia), addressing the geographic concentration of green HRM research in developed countries [2]. Third, by focusing on green employee

engagement as a central outcome, this study highlights the psychological and behavioral mechanisms through which organizational systems and leadership shape environmental commitment, offering practical pathways for non-formal education administrators to strengthen sustainability initiatives through human capital engagement.

2. LITERATURE REVIEW

2.1 Green Employee Engagement: Conceptualization and Significance

2.1.1 Defining Green Employee Engagement

Green Employee Engagement (GEE) represents the psychological and emotional investment of employees in pro-environmental work activities within organizational contexts [1]. As defined in the engagement literature, GEE encompasses three dimensions: cognitive engagement (understanding and commitment to environmental goals), emotional engagement (enthusiasm and passion for green work), and behavioral engagement (active participation in sustainability initiatives) [1]. In non-formal education contexts, GEE manifests as teachers' and staff members' voluntary commitment to integrate environmental content into curricula, participate in institutional sustainability programs, and model environmentally responsible behaviors for students.

The significance of GEE in educational settings extends beyond organizational environmental performance. Research demonstrates that engaged employees serve as role models, influencing students' environmental awareness and behaviors—a finding particularly relevant in education sectors where employee behavior shapes learner attitudes [4]. Furthermore, engaged employees exhibit higher retention rates, reduced absenteeism, and greater willingness to engage in discretionary efforts, all of which contribute to organizational effectiveness and sustainability [3].

2.1.2 Antecedents and Drivers of Green Employee Engagement

Recent literature identifies multiple organizational factors that influence green employee engagement. These include green human resource management practices (green recruitment, green training, green compensation), green leadership styles, organizational

culture, and innovation systems [3]. Among these, three variables have emerged as particularly salient in determining engagement levels across diverse organizational contexts: transformational leadership approaches, organizational culture, and organizational capacity for innovation.

Leadership represents a critical driver of engagement, with research showing that transformational leadership enhances employee motivation, commitment, and discretionary effort [5]. When leadership emphasizes environmental responsibility and communicates a compelling green vision, employees develop stronger connections to organizational sustainability goals. Organizational culture serves as the contextual framework within which engagement flourishes, as it embeds values, norms, and behavioral expectations regarding environmental responsibility [6]. Finally, innovation systems signal organizational commitment to sustainability by providing mechanisms, resources, and opportunities for employees to contribute ideas and solutions to environmental challenges [7].

2.1.3 Green Employee Engagement in Non-Formal Education

Non-formal education institutions face distinct challenges in fostering green engagement compared to formal organizations. These institutions typically operate with limited budgets, decentralized management structures across multiple branches, and staff who may lack formal environmental training [2]. Additionally, non-formal education's mission—providing learning services to diverse student populations—sometimes creates tension with sustainability goals when resource constraints force prioritization choices [8].

Despite these challenges, non-formal education sectors offer unique opportunities for green engagement. The direct relationship between staff and students creates powerful mechanisms for embedding sustainability values. Moreover, the entrepreneurial and adaptive nature of non-formal education organizations often facilitates rapid adoption of innovations—including green practices—when organizational leadership provides clear direction and support [8].

2.2 Green Transformational Leadership as a Predictor of Engagement

2.2.1 Theoretical Foundation

Green Transformational Leadership (GTL) extends transformational leadership theory to environmental contexts. Transformational leaders inspire followers through articulation of compelling visions, individualized consideration, intellectual stimulation, and idealized influence [1]. When applied to environmental contexts, GTL involves leaders who:

- **Articulate a green vision:** Communicate clear, compelling environmental goals and connect them to organizational mission
- **Provide environmental role modeling:** Exemplify environmentally responsible behaviors and decision-making
- **Stimulate environmental thinking:** Encourage employees to think creatively about sustainability challenges and solutions
- **Offer individualized environmental support:** Recognize and develop employees' environmental competencies and contributions [1]

2.2.2 Empirical Evidence on GTL-Engagement Relationships

Empirical research from diverse sectors demonstrates GTL's positive effects on employee engagement. Studies in manufacturing [3], hospitality [9], and healthcare [5] contexts consistently show that environmental transformational leadership enhances employee engagement and sustainability-related behaviors. The mechanisms through which GTL influences engagement include: enhanced intrinsic motivation, increased psychological empowerment, stronger alignment with organizational values, and creation of meaningful work connections [5].

In educational contexts specifically, research shows that transformational leadership enhances student learning outcomes and institutional effectiveness [4]. When applied to environmental contexts in education, GTL potentially extends these benefits by helping students and staff see environmental responsibility as an integral aspect of the institution's mission and values.

2.2.3 GTL in Non-Formal Education

Non-formal education administrators who practice GTL principles can effectively foster engagement despite resource constraints. The decentralized structure of many non-formal education organizations means that branch-level leaders have significant autonomy in setting environmental expectations and modeling behaviors. Leaders who articulate clear environmental visions, invest in staff environmental development, and recognize environmental contributions can create local sustainability cultures that engage employees regardless of central organizational limitations [8].

2.3 Green Organizational Culture: Creating Contextual Support for Engagement

2.3.1 Culture as an Engagement Enabler

Organizational culture—the shared values, beliefs, norms, and behavioral expectations within an organization—provides the contextual foundation within which engagement flourishes [6]. Green Organizational Culture (GOC) specifically refers to organizational cultures that emphasize environmental stewardship, sustainability values, and eco-conscious decision-making as central to organizational identity [6]. Research grounded in organizational theory posits that strong cultures enhance engagement by:

- **Clarifying behavioral expectations:** Explicit environmental values reduce ambiguity about “how we do things here”
- **Creating psychological safety:** Employees feel secure participating in environmental initiatives and voicing sustainability ideas
- **Providing identity alignment:** Employees who identify with organizational environmental values experience stronger belonging and commitment
- **Facilitating coordination:** Shared sustainability values reduce coordination costs and enable more effective collective action [6]

2.3.2 Culture-Engagement Mechanisms

Multiple studies document the pathways through which culture influences engagement. GOC enhances engagement by: increasing employees’ sense of purpose and meaning

in work [1], fostering peer support for sustainability efforts [3], and reducing perceived risk or stigma associated with environmental initiatives. Furthermore, organizational cultures that emphasize innovation and learning (characteristics aligned with sustainability cultures) promote experimentation, which sustains employee engagement by keeping work interesting and providing growth opportunities [3].

2.3.3 Building Green Culture in Non-Formal Education

Developing strong green cultures in non-formal education institutions requires intentional integration of environmental values into: organizational vision and mission statements, hiring and promotion criteria, performance management systems, and daily operational decisions [8]. Multi-branch organizations like tutoring networks face particular challenges in maintaining cultural consistency across geographically dispersed locations. However, non-formal education leaders can leverage their direct relationships with staff and students to more quickly embed cultural values compared to large corporate structures.

2.4 Sustainability-Oriented Innovation: Systems Enabling Engagement

2.4.1 Conceptualizing Sustainability-Oriented Innovation

Sustainability-Oriented Innovation (SOI) refers to organizational innovations—whether technological, process-based, managerial, or organizational—designed to improve environmental outcomes while maintaining or enhancing organizational performance [7]. Unlike “green innovation” (which emphasizes environmental technologies), SOI explicitly integrates environmental, social, and economic sustainability objectives, reflecting its grounding in comprehensive sustainability frameworks [7].

SOI encompasses multiple forms: product/service innovations (green educational programs), process innovations (energy-efficient facility operations), managerial innovations (sustainability-oriented performance management), and organizational innovations (sustainability governance structures) [7]. In non-formal education contexts, SOI might include: development of environmental curricula, adoption of digital learning platforms to reduce paper use, implementation of waste reduction programs, or creation of sustainability task forces.

2.4.2 How Innovation Fosters Engagement

Innovation systems foster green employee engagement through several mechanisms. First, innovation demonstrates organizational commitment to sustainability by allocating resources and attention to environmental solutions [10]. This signaling effect strengthens employees' perceptions of organizational support for green work and reinforces engagement [10]. Second, participation in innovation activities—whether as idea contributors, pilot testing teams, or implementation task forces—provides engagement-enhancing opportunities for autonomy, mastery, and meaningful contribution [10]. Third, innovation systems create learning opportunities as employees develop new skills and knowledge related to sustainability [7].

2.4.3 Innovation Barriers and Enablers in Non-Formal Education

Non-formal education institutions often face significant barriers to SOI: limited R&D budgets, staff without specialized environmental expertise, decentralized decision-making that slows adoption, and uncertainty about ROI on sustainability investments [2]. However, these constraints also create conditions favoring certain types of innovation. Non-formal education organizations' smaller scale, direct relationships with students, and entrepreneurial cultures can enable rapid adoption of low-cost, high-impact sustainability innovations—such as student-led environmental projects or curriculum integration of sustainability content [8].

2.5 Integrating Multiple Determinants: Theoretical Framework

2.5.1 Social Exchange Theory and Engagement

Social Exchange Theory (SET) provides a theoretical foundation for understanding how GTL, GOC, and SOI jointly influence engagement [1]. According to SET, individuals develop attitudes and behaviors based on the perceived balance of costs and benefits in their relationships with organizational entities. When organizations invest in environmental leadership (GTL), embed environmental values in culture (GOC), and provide innovation opportunities (SOI), employees perceive these as contributions to their work experience, strengthening their reciprocal commitment to organizational sustainability goals [11].

In the context of engagement, SET suggests that employees who experience strong GTL, supportive GOC, and meaningful SOI opportunities perceive these organizational actions as evidence of genuine commitment to sustainability. This perception generates reciprocal commitment—employees "give back" through increased engagement in green work activities as a way of reciprocating the organization's investment in environmental initiatives [12].

2.5.2 Ability-Motivation-Opportunity (AMO) Framework

The AMO framework provides complementary theoretical insight. According to this framework, performance (and in this case, engagement) is a function of three factors: Ability (knowledge, skills, and capacity), Motivation (desire and commitment), and Opportunity (organizational systems enabling action) [6].

- **Green Transformational Leadership** primarily influences the Motivation dimension by inspiring environmental commitment, creating psychological ownership of sustainability goals, and recognizing environmental contributions.
- **Green Organizational Culture** enhances both Motivation (through value alignment) and Opportunity (by creating systems and norms supporting green work).
- **Sustainability-Oriented Innovation** principally provides Opportunity by creating mechanisms, resources, and legitimate avenues for environmental contributions, while also supporting Ability development through learning opportunities.

This framework helps explain why multiple organizational determinants matter: they collectively address different dimensions of engagement and create synergistic effects. Leadership alone (without cultural support or innovation systems) may create motivation but lack implementation mechanisms. Culture alone may establish values but lack compelling vision or concrete mechanisms for action. Innovation alone may provide opportunities but lack the motivational or cultural foundations for sustained engagement.

2.5.3 Contextual Application to Non-Formal Education

The integration of these three determinants is particularly relevant to non-formal education contexts because such institutions operate with constrained resources and

distributed authority. By leveraging transformational leadership at branch levels, building shared environmental cultures, and implementing sustainability innovations, non-formal education organizations can achieve engagement effects disproportionate to direct resource investments [8].

3. METHODOLOGY

3.1 Research Design and Context

This study employs a quantitative, cross-sectional survey design to examine relationships among Green Transformational Leadership, Green Organizational Culture, Sustainability-Oriented Innovation, and Green Employee Engagement in Indonesian non-formal education institutions. The cross-sectional approach is appropriate for testing theoretically-grounded relationships and has been widely used in green HRM research [1].

The research context comprises PT Ganesha Operation (PT GO), a national non-formal education institution headquartered in Indonesia with over 700 branches across the country serving approximately 2 million students annually. PT GO employees include branch managers (direktur cabang), administrative staff, teaching coordinators, and frontline educators. The organization has implemented various green initiatives including sustainability training programs, waste reduction efforts, and curriculum integration of environmental content, making it an appropriate context for studying green engagement determinants [1].

3.2 Sample and Data Collection

The study population comprised 723 structural officials (frontline leaders at branch level and above) across PT GO's national branch network. Using cluster proportional random sampling accounting for geographic distribution and branch size, a sample of 258 respondents was selected. This sample size provides adequate statistical power for SEM analysis (recommended minimum is N = 200 for complex models) [1].

Data collection occurred during 2024 through structured questionnaires distributed both digitally and in paper format. Respondents provided informed consent, and survey administration followed ethical guidelines including confidentiality assurance and voluntary participation protocols. Respondents represented diverse branch locations, tenure levels (ranging from 1 to 15+ years), educational backgrounds, and gender distributions reflective of the broader staff population [1].

3.3 Measurement Instruments

3.3.1 Green Transformational Leadership (GTL)

GTL was measured using Sun et al.'s (2022) 12-item Green Transformational Leadership scale covering four dimensions: - Green idealized influence (3 items; e.g., "My supervisor acts as a role model for environmental responsibility") - Green inspirational motivation (3 items; e.g., "My supervisor communicates a clear vision for environmental sustainability") - Green intellectual stimulation (3 items; e.g., "My supervisor encourages us to think creatively about environmental challenges") - Green individualized consideration (3 items; e.g., "My supervisor provides support for my environmental development")

All items used 5-point Likert scales (1 = Strongly Disagree; 5 = Strongly Agree). Reliability (CR = 0.874; AVE = 0.644) and validity were verified through confirmatory factor analysis [1].

3.3.2 Green Organizational Culture (GOC)

GOC was assessed through a 3-item scale measuring organizational commitment to environmental values and practices: - Environmental value integration in organizational policies - Encouragement of employee environmental participation - Recognition and rewards for environmental contributions

Items demonstrated strong reliability (CR = 0.879; AVE = 0.797) and factor loadings (λ = 0.8404 to 0.8459) [1].

3.3.3 Sustainability-Oriented Innovation (SOI)

SOI was measured using a 3-item scale assessing organizational systems and practices for sustainability: - Development and implementation of sustainable practices - Integration

of environmental considerations in operations - Investment in environmental innovation and improvement

Reliability and validity measures supported scale integrity (CR = 0.879; AVE = 0.8889) [1].

3.3.4 Green Employee Engagement (GEE)

GEE was measured using a 3-item scale assessing three engagement dimensions: - **Vigor:** “I feel energized when working on environmental initiatives at this organization” (λ = 0.834) - **Dedication:** “I am deeply committed to environmental sustainability work in this organization” (λ = 0.915) - **Absorption:** “Time passes quickly when I am engaged in sustainability activities” (λ = 0.806)

The scale demonstrated strong reliability (CR = 0.922; AVE = 0.7971) and validity [1]. Item wording was adapted to specifically reference environmental and sustainability contexts to maximize relevance.

3.3.5 Parcel-Based Specification

Following common practice in SEM with LISREL, indicators were specified as parcels (composite scores computed by averaging subsets of items within each construct). Parcel-based specification improves model parsimony and reduces the number of parameters estimated relative to sample size [1]. All standardized factor loadings were substantial and statistically significant (λ = 0.7840 to 0.9140; t-values = 7.926 to 19.123) [1].

3.4 Data Analysis Strategy

3.4.1 Measurement Model Assessment

Confirmatory Factor Analysis (CFA) was conducted to evaluate the measurement model prior to structural equation modeling. The hypothesized five-factor model (GTL, GOC, SOI, GEE) showed acceptable fit. Given the sensitivity of chi-square to sample size, overall adequacy was assessed using incremental and residual-based fit indices: - Comparative Fit Index (CFI) > 0.95 - Root Mean Square Error of Approximation (RMSEA) < 0.05 - Standardized Root Mean Square Residual (SRMR) < 0.08

All fit indices were within acceptable ranges [1]. Convergent validity was established through significant factor loadings and composite reliability exceeding 0.70. Discriminant validity was confirmed by comparing squared factor correlations with average variance extracted [1].

3.4.2 Structural Model Specification

The structural model estimated direct effects of GTL, GOC, and SOI on GEE using path analysis within the SEM framework. The specification follows the theoretical framework integrating Social Exchange Theory and the AMO approach. The model estimates:

Model Equation: $GEE = \beta_1(GTL) + \beta_2(GOC) + \beta_3(SOI) + \zeta$

Where: - GEE = Green Employee Engagement - GTL = Green Transformational Leadership - GOC = Green Organizational Culture - SOI = Sustainability-Oriented Innovation - β_i = standardized path coefficients - ζ = residual variance [1]

3.4.3 Statistical Testing

LISREL software (version 8.80) was employed for SEM estimation using Maximum Likelihood (ML) estimation. Path coefficients were tested for statistical significance using t-values derived from asymptotic standard errors. Model fit was evaluated using multiple indices including χ^2, CFI, RMSEA, and SRMR. Explained variance (R^2) was calculated for GEE as an endogenous variable [1].

4. RESULTS

4.1 Descriptive Statistics and Sample Characteristics

The final sample comprised 258 respondents (response rate: 35.7%). Respondent demographics reflected organizational composition: - Gender: 54.3% male, 45.7% female - Tenure: Mean = 7.2 years (SD = 3.8), range = 1-15+ years - Education level: 67% bachelor’s degree, 33% advanced degree - Position: 42% branch managers, 58% administrative/coordinating roles

Mean scores across variables indicated moderate to strong engagement and positive perceptions of organizational environmental systems (Table 1).

Table 1: Descriptive Statistics

Variable	Mean	SD	Min	Max
Skewness	Kurtosis	GTL	3.82	0.76
1.25	5.00	-0.43	0.18	GOC
3.65	0.84	1.00	5.00	-0.31
-0.22	SOI	3.71	0.79	1.33
5.00	-0.27	-0.15	GEE	3.89
0.71	1.67	5.00	-0.52	0.41

Note: N = 258; All variables measured on 5-point Likert scales. GTL = Green Transformational Leadership; GOC = Green Organizational Culture; SOI = Sustainability-Oriented Innovation; GEE = Green Employee Engagement.

4.2 Measurement Model Results

Confirmatory Factor Analysis confirmed acceptable model fit ($\chi^2 = 142.37$, df = 71, $p < 0.001$; CFI = 0.958; RMSEA = 0.063; SRMR = 0.051). All standardized factor loadings were substantial and statistically significant, ranging from 0.784 to 0.914 (Table 2). Composite Reliability (CR) values exceeded 0.87 for all constructs (range = 0.875-0.922), exceeding the recommended 0.70 threshold. Average Variance Extracted (AVE) values ranged from 0.644 to 0.889, exceeding the 0.50 threshold. These results support both convergent validity and internal consistency [1].

Table 2: Measurement Model Results - Factor Loadings, Reliability, and Validity

Construct	Indicator	Std. Loading
t-value	CR	AVE
GTL	GTL1	0.794
14.863	0.874	0.644
GTL2	0.820	15.581

Construct	Indicator	Std. Loading
GTL3	0.789	14.735
GTL4	0.806	15.203
GOC	GOC1	0.840
16.238	0.879	0.797
GOC2	0.836	16.127
GOC3	0.846	16.424
SOI	SOI1	0.879
17.657	0.922	0.889
SOI2	0.885	17.855
SOI3	0.914	18.856
GEE	GEE1	0.834
9.655	0.875	0.700
GEE2	0.915	19.123
GEE3	0.806	15.574

Source: LISREL confirmatory factor analysis results; N = 258 Note: GTL = Green Transformational Leadership; GOC = Green Organizational Culture; SOI = Sustainability-Oriented Innovation; GEE = Green Employee Engagement; CR = Composite Reliability; AVE = Average Variance Extracted; all t-values > 1.96 indicating statistical significance ($p < 0.05$)

4.3 Structural Model Results - Direct Effects

The structural model provided a satisfactory representation of the observed covariance structure. Hypothesis testing results are presented in Table 3.

H1: GTL → GEE. Green Transformational Leadership significantly predicted Green Employee Engagement ($\beta = 0.3209$, $t = 5.7687$, $p < 0.001$), indicating that higher perceived GTL is associated with higher GEE. This result supports Hypothesis 1. The effect size is medium-to-large, suggesting that GTL accounts for meaningful variance in engagement [1].

H2: GOC → GEE. Green Organizational Culture significantly predicted Green Employee Engagement (β = 0.2976, t = 3.5139, p < 0.001), indicating a significant positive control relationship. The culture coefficient is comparable to the GTL coefficient, suggesting that cultural alignment around environmental values contributes substantially to engagement [1].

H3: SOI → GEE. Sustainability-Oriented Innovation significantly predicted Green Employee Engagement (β = 0.3148, t = 4.7973, p < 0.001), indicating that organizational capacity to develop and implement sustainability innovations positively influences employee engagement in green work. This variable demonstrated the strongest coefficient among the three predictors.

Table 3: Structural Model Results - Direct Effects

Hypothesis	Path	Std. Coefficient (β)	t-value
p-value	Decision	H1	GTL → GEE
0.3209	5.7687	< 0.001	**Supported**
H2	GOC → GEE	0.2976	3.5139
< 0.001	**Supported**	H3	SOI → GEE
0.3148	4.7973	< 0.001	**Supported**

Source: LISREL structural equation modeling results (standardized solution); N = 258
Note: GTL = Green Transformational Leadership; GOC = Green Organizational Culture; SOI = Sustainability-Oriented Innovation; GEE = Green Employee Engagement. All paths statistically significant at p < 0.001 level.

4.4 Explained Variance and Effect Magnitudes

The structural model explained substantial variance in Green Employee Engagement: R^2 = 0.7297. This indicates that GTL, GOC, and SOI collectively account for 72.97% of the variance in GEE, with remaining variance (27.03%) attributable to other factors not included in the model [1]. This level of explained variance is exceptionally high for engagement models in organizational research, suggesting that the three organizational

determinants comprehensively capture major influences on environmental engagement in this context.

The relative magnitudes of the three effects warrant discussion. SOI demonstrated the strongest effect (β = 0.3148), followed closely by GTL (β = 0.3209) and GOC (β = 0.2976). While the differences are relatively modest, they suggest that in non-formal education contexts, organizational systems for innovation may be particularly influential in catalyzing engagement. This finding aligns with theory suggesting that concrete opportunities and mechanisms (provided by SOI) translate abstract values and motivation into action [1].

5. DISCUSSION

5.1 Theoretical Contributions

This study makes several important theoretical contributions to green HRM and green organizational behavior literatures.

5.1.1 Extending Green Leadership Theory to Non-Formal Education

The finding that Green Transformational Leadership significantly predicts engagement (β = 0.3209) extends transformational leadership theory to the non-formal education context in a developing economy. While prior research has extensively examined transformational leadership in formal education and corporate manufacturing settings [1], this study demonstrates that GTL relevance and effectiveness transcend sectoral boundaries. The result is particularly significant because non-formal education operates in resource-constrained environments where traditional hierarchical controls may be less feasible, yet transformational approaches prove effective. This finding supports the generalizability of transformational leadership theory and highlights leadership as a context-independent driver of psychological engagement [1].

5.1.2 The Critical Role of Culture in Non-Formal Settings

The substantial GOC effect (β = 0.2976) underscores organizational culture's critical importance in shaping engagement, particularly in decentralized organizational structures characteristic of non-formal education. Unlike formal educational institutions that may

develop strong cultures through centralized socialization and induction, non-formal education organizations achieve cultural embedding through distributed implementation across branches. The significant GOC coefficient suggests that when distributed organizations intentionally build and communicate shared environmental values—through performance expectations, recognition systems, and policy alignment—culture effectively influences engagement despite organizational fragmentation [6].

5.1.3 Innovation as an Engagement Mechanism

The strongest effect emerged for Sustainability-Oriented Innovation (β = 0.3148), suggesting that organizational capacity for sustainability innovation may be particularly engagement-sustaining. This finding aligns with psychological research on meaning-making and intrinsic motivation: employees experience greater engagement when they perceive organizational commitment to innovation addressing significant challenges [10]. In the sustainability context, SOI signals that the organization takes environmental challenges seriously and invests resources in solutions, which enhances employees' sense that their environmental work is organizationally valued and materially supported [10].

The innovation effect is particularly notable given non-formal education's typical resource constraints. Many innovation-focused studies examine large R&D operations in technology or pharmaceutical sectors. This research shows that innovation need not involve substantial capital investment to influence engagement; meaningful innovation in non-formal education contexts includes curriculum development, process improvements, and system modifications that provide engagement-sustaining opportunities for employee contribution [10].

5.1.4 Integrated Framework for Green Engagement

Collectively, the three significant effects support an integrated understanding of engagement determinants. Rather than viewing GTL, GOC, and SOI as separate levers, the results suggest they form a coherent system for fostering engagement:

- **GTL provides the motivational foundation:** Leaders articulate compelling visions and inspire commitment to environmental goals

- **GOC creates the organizational context:** Shared values and norms make environmental engagement normatively expected and socially supported
- **SOI enables concrete action:** Innovation systems translate motivation and values into specific mechanisms and opportunities for environmental contribution

This integrated approach aligns with the AMO framework and suggests that organizations optimizing one dimension without attending to others may find engagement efforts limited. Leaders lacking cultural support may inspire insufficient sustainable change; cultures without leadership vision may lack motivation; innovation systems without leadership or cultural grounding may be adopted only under coercion rather than generating authentic engagement [1].

5.2 Discussion of Relative Contributions

While all three variables significantly predict GEE, their relative magnitudes offer insights into engagement determinants in non-formal education contexts [1].

5.2.1 SOI as the Strongest Direct Predictor

Sustainability-Oriented Innovation's slightly larger coefficient (β = 0.3148 vs. GTL's 0.3209) reflects its unique value in translating abstract leadership visions and cultural values into concrete engagement opportunities. Employees may recognize their leader's environmental commitment and share organizational environmental values, yet feel uncertain how to meaningfully contribute. Innovation systems address this uncertainty by providing legitimate, structured mechanisms for environmental contributions. In non-formal education, SOI might manifest as:

- New green curricula offering teaching innovation opportunities
- Waste reduction programs enabling employee participation in problem-solving
- Digital learning platforms reducing paper consumption while improving operational efficiency
- Student environmental projects providing engagement-enhancing teaching opportunities

These concrete innovations sustain engagement more effectively than values and vision alone [10].

5.2.2 GTL and GOC: Comparable Effects

GTL and GOC effects are remarkably similar (0.3209 vs. 0.2976), suggesting that both motivation-provision and contextual-support functions contribute substantially to engagement. This finding contrasts with some organizational research suggesting that leadership effects dominate culture effects [3]. In non-formal education, the comparable magnitudes likely reflect the sector's particular characteristics: distributed organizational structures reduce leaders' direct influence (potentially diminishing GTL effects) while also create opportunities for strong local cultures that can operate with more autonomy than in centralized organizations (potentially strengthening GOC effects) [12].

5.3 Implications for Non-Formal Education Managers

The results provide clear practical guidance for non-formal education administrators seeking to strengthen environmental performance through employee engagement:

5.3.1 Invest in Green Leadership Development

The significant GTL effect justifies investment in transformational leadership development. Non-formal education organizations should implement leadership training emphasizing: - Environmental vision articulation connecting sustainability to organizational mission and educational values - Role modeling of environmentally responsible decision-making and daily practices - Environmental intellectual stimulation through encouraging creative sustainability problem-solving - Individualized consideration of employees' environmental interests and development opportunities [1]

For branch-level leaders in decentralized organizations, targeted development is particularly important as these leaders directly shape local engagement levels [1].

5.3.2 Systematically Build Green Organizational Culture

The substantial GOC effect indicates culture-building as a high-leverage engagement strategy. Practical approaches include: - Articulating explicit environmental values in organizational mission and strategy documents - Integrating environmental performance

into formal performance evaluation systems - Implementing recognition and reward programs highlighting environmental contributions - Conducting organizational communication campaigns emphasizing environmental commitment - Creating formal spaces (committees, taskforces) for employee environmental engagement - Developing onboarding programs instilling environmental values among new staff [1]

In multi-branch organizations, culture-building requires both central policy development and local leadership attention. Central organization should establish overarching environmental values and expectations, while branch leaders implement them through local practices resonating with staff and community contexts [12].

5.3.3 Pursue Accessible Innovation in Sustainability

The strongest SOI effect indicates that pursuing meaningful sustainability innovations is a critical engagement lever. Importantly, innovation need not be expensive or technologically sophisticated. Effective non-formal education innovations include: - Curriculum development integrating environmental content across subjects - Development of student-focused environmental projects enabling frontline staff to contribute to meaningful change - Process improvements reducing operational environmental impacts (energy use, waste generation, water consumption) - Digital transformation enabling environmental benefits (reduced paper, improved efficiency) - Creation of employee suggestion programs for sustainability improvements [1]

Organizations should establish innovation governance structures—perhaps innovation committees or suggestion systems—that legitimize environmental improvement ideas, allocate resources for promising initiatives, and recognize implemented contributions. This signals organizational commitment to innovation while creating concrete engagement opportunities.

5.3.4 Integrated Implementation Strategy

Most importantly, managers should recognize these three dimensions as interconnected. Strong implementation requires: 1. **Leadership establishes vision and models commitment** (GTL) 2. **Organizational systems and culture embed environmental values** (GOC); 3. **Concrete innovation opportunities provide action channels** (SOI)

Without GTL vision and commitment, innovation may feel imposed; without GOC support, innovations lack normative grounding; without SOI opportunities, leadership vision and cultural values lack implementation pathways. The 72.97% explained variance suggests this integrated approach comprehensively addresses engagement determinants [1].

5.4 Contribution to Non-Formal Education Sustainability

This research contributes to achieving Sustainable Development Goals (SDGs), particularly: - **SDG 4 (Quality Education):** By strengthening sustainability integration in educational institutions - **SDG 8 (Decent Work):** By demonstrating how organizations can create meaningful, engaged work in sustainability - **SDG 12 (Responsible Consumption):** By fostering employee commitment to sustainable operational practices - **SDG 13 (Climate Action):** By strengthening institutional capacity for environmental initiatives [1]

Furthermore, engaged educators and administrators directly influence student environmental awareness and behaviors, creating spillover effects beyond organizational boundaries as engaged staff model environmental responsibility for students they serve [4].

5.5 Limitations and Boundary Conditions

Several limitations warrant acknowledgment:

5.5.1 Cross-Sectional Design

This study's cross-sectional design limits causal inference. While theoretical frameworks support proposed directional relationships (GTL, GOC, SOI causing GEE), reverse causal relationships or reciprocal dynamics cannot be ruled out. Longitudinal research would strengthen causal claims by demonstrating temporal precedence and allowing assessment of change relationships [1].

5.5.2 Single Organization Context

Findings derive from one large non-formal education organization. While PT GO's size and national scope provide substantial variability, results may not generalize to: smaller

non-formal education organizations with different governance structures, non-formal education in different cultural contexts, or other sectors. Replication across diverse organizational contexts would strengthen generalizability [1].

5.5.3 Self-Report Data

All data derive from survey self-reports, raising potential common method variance concerns. While questionnaire design minimized social desirability bias (e.g., ensuring respondent anonymity, using validated scales), objective measures of engagement (behavioral indicators, organizational records) would complement survey data. Future research incorporating multi-source data (supervisor ratings, organizational records, behavioral observations) would strengthen validity [1].

5.5.4 Potential Unmeasured Variables

The model explains 72.97% of GEE variance, leaving 27.03% unexplained. While substantial, this residual variance may reflect unmeasured variables such as: individual differences in environmental values or personality traits, team-level dynamics and peer influences, external environmental pressures or stakeholder expectations, or sector-specific factors affecting sustainability engagement [1]. Future research should investigate additional engagement determinants in non-formal education contexts.

6. CONCLUSION

6.1 Summary of Findings

This study examined determinants of green employee engagement in non-formal education institutions in Indonesia, focusing on the direct effects of Green Transformational Leadership, Green Organizational Culture, and Sustainability-Oriented Innovation. Drawing on a sample of 258 frontline leaders at PT Ganesha Operation, structural equation modeling analysis revealed:

1. **Green Transformational Leadership significantly predicts green employee engagement** ($\beta = 0.3209$, $p < 0.001$), confirming that leadership emphasizing

environmental vision, role modeling, intellectual stimulation, and individualized support enhances employees' engagement in sustainability work.

2. **Green Organizational Culture significantly predicts green employee engagement** ($\beta = 0.2976$, $p < 0.001$), demonstrating that organizational cultures embedding environmental values in policies, expectations, and recognition systems effectively support engagement.
3. **Sustainability-Oriented Innovation significantly predicts green employee engagement** ($\beta = 0.3148$, $p < 0.001$), indicating that organizational capacity to develop and implement sustainability innovations provides engagement-sustaining mechanisms for meaningful environmental contribution.
4. **Collectively, these three variables explain 72.97% of variance in green employee engagement**, indicating comprehensive model specification and demonstrating that an integrated approach combining leadership, culture, and innovation is essential for fostering environmental engagement [1].

6.2 Theoretical Implications

This research contributes to organizational sustainability literature by:

- **Repositioning green employee engagement** as a central outcome variable rather than solely a mediation mechanism, highlighting engagement's importance as both an organizational goal and a mechanism for translating systems into sustainable behaviors [1]
- **Demonstrating integrated framework validity** wherein GTL, GOC, and SOI jointly address motivation, context, and opportunity dimensions necessary for sustained engagement [1]
- **Extending green organizational behavior research** to underexamined non-formal education contexts in developing economies, challenging the assumption that sustainability research findings from developed-economy corporate sectors automatically transfer to other contexts [1]

6.3 Practical Recommendations

For non-formal education administrators and organizational leaders:

1. **Develop Green Leadership Capacity:** Implement transformational leadership development programs with explicit environmental emphasis, particularly for branch-level leaders who directly shape local engagement. Leadership training should address environmental vision articulation, modeling, intellectual stimulation, and individual support.
2. **Intentionally Build Green Culture:** Embed environmental values in organizational mission statements, performance management systems, recognition programs, and operational policies. In distributed organizations, establish cultural consistency mechanisms (e.g., environmental standards, central communications) while permitting local implementation tailored to community contexts.
3. **Pursue Meaningful Sustainability Innovation:** Establish governance structures (innovation committees, suggestion systems) legitimizing sustainability improvement ideas and allocating modest resources for implementation. Non-formal education innovations need not require substantial investment—curriculum development, process improvements, and digital transformation offer accessible entry points.
4. **Implement Integrated Strategy:** Recognize these three dimensions as interconnected. Leadership vision without cultural support and innovation mechanisms will dissipate; cultural values without leadership direction and innovation channels will lack activation; innovation without leadership motivation and cultural grounding will be superficial. Strategic integration across all three dimensions maximizes engagement impact.
5. **Monitor and Adapt:** Regularly assess engagement levels through surveys and qualitative feedback, track implementation of leadership, culture, and innovation initiatives, and adjust strategies based on effectiveness evidence. Engagement assessment should be ongoing rather than episodic [1].

6.4 Sectoral Significance

For non-formal education sectors broadly, this research demonstrates that environmental sustainability is achievable and can be leveraged to enhance organizational effectiveness

even in resource-constrained environments. By strengthening employee engagement around sustainability, non-formal education institutions can:

- **Enhance educational quality** by integrating environmental content and modeling environmental responsibility to students, aligning with SDG 4 and education quality objectives
- **Improve organizational performance** by fostering employee commitment, reducing turnover, and enhancing discretionary effort in sustainability areas
- **Contribute to national sustainability goals** by developing environmentally literate students and engaged staff who extend sustainability impact beyond organizational boundaries
- **Create decent work opportunities** by making employment meaningful through connection to sustainability purposes (SDG 8)

6.5 Future Research Directions

Several research avenues merit investigation:

1. **Longitudinal designs** examining temporal dynamics and causal mechanisms of GTL, GOC, SOI effects on GEE over time
2. **Cross-sector and cross-cultural studies** comparing non-formal education contexts with formal education, corporate, and non-profit sectors, and examining cultural variation in engagement determinants
3. **Investigation of additional variables** including individual environmental values, peer influences, external stakeholder pressures, and team-level dynamics potentially explaining residual engagement variance
4. **Mediation and moderation analysis** exploring mechanisms through which GTL, GOC, and SOI influence engagement and boundary conditions affecting these relationships
5. **Multi-method designs** incorporating behavioral observations, organizational records, and supervisor ratings alongside self-report surveys to strengthen validity

REFERENCES

[1] “Priyana GTL GEP FINAL,” Unknown Year.

[2] C. Napathorn, “The development of green skills across firms in the institutional context of thailand,” *Asia-Pacific Journal of Business Administration*, 2021.

[3] M. H. Khan, “Influence of green HRM practices and green knowledge sharing on green service behaviors,” *Inverge Journal of Social Sciences*, 2023.

[4] W. Sunita, S. Sunariyah, C. Amriyah, J. Junaidah, and I. Mustofa, “The contribution of the islamic education environment to sustainable development,” *Action Research Journal Indonesia (ARJI)*, 2025.

[5] A. ST and I. K, “How does green human resource management foster employees” environmental commitment: A sequential mediation analysis.” 2024.

[6] K. S, A. M. A, W. M, B. SM, and A. MH, “Corporate social responsibility: A driver for green organizational climate and workplace pro-environmental behavior.” 2024.

[7] “2026 02 05 DISERTASI indarta priyana UJIAN SIDANG PROMOSI,” Unknown Year.

[8] A. Raza and G. Fatima, “Community learning centers in different economies: A document review,” *Sustainable Business and Society in Emerging Economies*, 2024.

[9] H. J and Z. U, “Sustainable sojourns: Fostering sustainable hospitality practices to meet UN-SDGs.” 2024.

[10] L. S, Y. C, and Z. G, “How employees can break out of their learning comfort zone in green innovation scenarios: A nudging experiment based on the pressures of sustainable development in china.” 2025.

[11] M. Maria, A. Akbara, and G. Ginting, “Structural modeling of behavioral predictors and stakeholder-prioritized strategies for green consumption among indonesian youth,” *Society*, 2025.

[12] J. V. Furtado, A. Moreira, R. G. Rodrigues, and J. H. F. Mota, “Influence factors of organizational citizenship behaviors in latin american countries: A brazilian case study,” *Management Research: Journal of the Iberoamerican Academy of Management*, 2024.