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The Role of Transformational Leadership on Environmental Performance Through Organizational Culture and Work Motivation at PT. Maligi Permata Industrial Estate Karawang

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Abstract
This research aims to analyze the influence of transformational leadership on environmental performance, with organizational culture and work motivation as mediating variables at PT. Maligi Permata Industrial Estate (MPIE) Karawang. The background of this study is based on the need for industrial companies to not only focus on economic efficiency but also on environmental sustainability, which is an important indicator in green industrial development. The research method used an explanatory quantitative approach with the Partial Least Squares–Structural Equation Modelling (PLS-SEM) technique. Data were collected through questionnaires administered to employees of the Utility and Environmental Control Division who are directly involved in the management of resources, energy, and the industrial estate environment. The results show that transformational leadership has a positive and significant effect on organizational culture, but does not directly affect work motivation or environmental performance. The effect of leadership on environmental performance is proven to be indirect, through organizational culture and work motivation as double mediators (serial mediation). In addition, organizational culture has a positive and significant effect on work motivation, while work motivation has a positive and significant effect on environmental performance. These findings confirm that the achievement of sustainable environmental performance is not only determined by policy and technology, but also by the synergy between visionary leadership, a sustainability-oriented organizational culture, and employee work motivation. This study contributes theoretically to the development of the concept of green transformational leadership and has practical implications for strengthening value-based environmental management systems and employee behavior in the industrial sector.

INTRODUCTION

Environmental sustainability has become the main focus in the management of modern industrial estates. Companies are no longer measured only by economic profitability, but also by their contribution to environmental preservation (Epstein, 2018). In this context, transformational leadership is a crucial leadership style because it is able to inspire changes in employee behavior and values towards a sustainability orientation (Rizvi & Garg, 2021; Virgiawan, Riyanto, & Endri, 2021).

However, the effectiveness of transformational leadership in improving environmental performance is not always immediate. Several studies (Boiral & Paillé, 2012; Yukl, 2013)

shows that the influence of leadership on employees' pro-environmental behavior is mediated by organizational culture factors and work motivation. A strong organizational culture instills the values of sustainability and collective responsibility, while work motivation encourages individuals to actively participate in eco-friendly activities (Qalati, Barbosa, & Ibrahim, 2025; Rapo, 2024; Swathi & Johnpaul, 2025).

Previous research has extensively examined the relationship between transformational leadership and organizational outcomes (Altassan, 2025). Bass (1999) found that transformational leadership positively influences organizational culture by articulating a compelling vision and modeling desired behaviors. Podsakoff et al. (1996) demonstrated that transformational leader behaviors enhance followers' trust, satisfaction, and organizational citizenship behaviors. In the context of environmental management, Boiral & Paillé (2012) confirmed that leadership commitment is a critical antecedent of organizational citizenship behavior for the environment (OCBE), where employees voluntarily engage in pro-environmental activities beyond formal requirements.

Furthermore, studies on organizational culture have consistently shown its pivotal role in shaping employee behavior . Denison (1990) established that organizational culture significantly affects organizational effectiveness and adaptability. Schein (2010) emphasized that leaders are the primary architects of organizational culture, as they create, embed, and evolve cultural norms. In the Indonesian industrial context, research has indicated that a sustainability-oriented culture mediates the relationship between leadership and environmental performance, though empirical evidence remains limited (Luthans, 2011; Robbins & Judge, 2019).

Regarding work motivation, Herzberg's (1966) two-factor theory suggests that intrinsic motivators—such as recognition, achievement, and responsibility drive employees to perform beyond minimum standards. Judge & Bono (2001) found a strong positive relationship between work motivation and job performance across various organizational settings. More recently, studies have shown that motivated employees are more likely to adopt pro-environmental behaviors, including energy conservation, waste reduction, and compliance with environmental policies (Robbins & Coulter, 2018; Sutrisno, 2019).

Despite these established relationships, research specifically examining the serial mediation mechanism where transformational leadership influences environmental performance sequentially through organizational culture and then work motivation remains scarce, particularly in the context of Indonesian industrial estates (Adwimurti, Murwaningsari, & Ramdan, 2026; Jain & Sharma, 2026; Sangadji & Islami, 2024; Udin, Chanthes, & Dananjoyo, 2025). Most prior studies (e.g., Boiral & Paillé, 2012; Yukl, 2013) have focused on direct effects or single-mediator models. This gap is significant because industrial estate management requires systemic coordination between leadership vision, cultural values, and employee motivation to achieve sustainable environmental outcomes (Mi et al., 2019).

PT. Maligi Permata Industrial Estate (MPIE) as the manager of the Karawang International Industrial City (KIIC) area is an example of a company that places environmental management as a strategic priority. The Utility and Environmental Control Division, which oversees clean water treatment, liquid waste, and environmental control, is the center of sustainability policy implementation activities.

Thus, this study seeks to examine the relationship model between transformational leadership, organizational culture, work motivation, and environmental performance, as well as identify the mediating role of organizational culture and work motivation in the context of industrial sustainability. Specifically, this study aims to test the serial mediation hypothesis whether transformational leadership influences environmental performance through the sequential pathway of organizational culture followed by work motivation an area that has received limited empirical attention in previous literature.

METHOD

This study used an explanatory quantitative approach using the Structural Equation Modeling-Partial Least Square (SEM-PLS) method. The research population is all employees of the Utility and Environmental Control Division at PT. MPIE Karawang with a total of 58 respondents.

A. Instruments and Measurements

The research variables include:

1. Transformational Leadership (KT) was measured using 4 adaptation indicators from Bass & Avolio (1995).
2. Organizational Culture (BO) uses 6 indicators based on Denison (1990) and Schein (2010).
3. Work Motivation (MK) uses 7 indicators based on Herzberg's (1966) theory of work motivation.
4. Environmental Performance (KL) uses 4 indicators based on Boiral & Paillé (2012) and ISO 14031.

Each indicator is measured on a Likert scale of 1–5 (1 = strongly disagree, 5 = strongly agree).

B. Data Analysis

The data is processed using SmartPLS 4.1.1.6 through two main stages:

1. Outer Model to test the validity and reliability of indicators (AVE, CR, Cronbach's Alpha).
2. Inner Model to test the relationships between variables (R^2, f^2, path coefficient, and bootstrapping test).

RESULT AND DISCUSSION

A. Test Measurement Model (Outer Model)

The results of the convergent validity test showed that all indicators had a loading factor value of > 0.70 and AVE > 0.5, so they were declared valid. The Composite Reliability (CR) values and Cronbach's Alpha of all variables are above 0.9, indicating excellent internal consistency.

Table 3.1. Measurement Model Test Results (Outer Model)

Variable	AVE	CR	Cronbach's Alpha	Status
Organizational Culture	0.622	0.911	0.883	Reliable
Transformational Leadership	0.704	0.931	0.910	Reliable
Environmental Performance	0.686	0.933	0.916	Reliable
Work Motivation	0.675	0.952	0.943	Reliable

Source: (Author, 2026)

The test results showed that all variables had an Average Variance Extracted (AVE) value above 0.50, indicating the fulfillment of convergent validity. The Composite Reliability

(CR) value for all constructs also exceeded the 0.70 limit, indicating excellent internal consistency. In addition, Cronbach's Alpha values of all variables were above 0.80, indicating high reliability in each indicator. Thus, the variables of Organizational Culture, Transformational Leadership, Environmental Performance, and Work Motivation were proven to be valid and reliable, making them suitable for use for advanced structural analysis in the research model.

B. Model Fit Test

The model fit test is performed to assess the extent to which the resulting structural model is in accordance with empirical data. This test aims to ensure that the relationships between variables in the SEM-PLS model are well matched and statistically reliable. The evaluation was carried out using several main parameters such as Standardized Root Mean Square Residual (SRMR), Chi-Square (χ^2), Normed Fit Index (NFI), and Goodness of Fit (GoF). These values are used to assess the extent to which the built model meets the overall fit criteria. The complete results of the model fit test are presented in the following table.

Table 2. Model Fit Test Results

Parameter	*Rule of Thumb*	Parameter Values	Status
SRMR	Less than 0.10	0.080	Fit
Chi Square	χ^2 Statistics ≥ χ^2 Table Chi-square / df ≤ 3	720.798 ≥ 240.266	Not Fit
NFI	Close to value 1	0.618	Lack of Fit
GoF	0.1 (small GoF), 0.25 (moderate GoF), 0.36 (strong GoF)	0.652	Strong Fit

Source: (Author, 2026)

The results of the model evaluation showed that the SRMR value of 0.080 was below the limit of 0.10, so the model was declared fit. The Chi-square value of 720,798 with χ^2 statistical $\chi^2 \geq \chi^2$ table (240,266) indicates that the model is not yet fully fit (not fit). The NFI value of 0.618 is still far from the ideal number close to 1, which indicates a lack of fit level. However, a Goodness of Fit (GoF) value of 0.652 falls into the strong fit category, confirming that the model as a whole has a good level of fit and is worthy of further interpretation.

C. Structural Model Test (Inner Model)

The R^2 value indicates the contribution of exogenous variables to endogenous as follows:

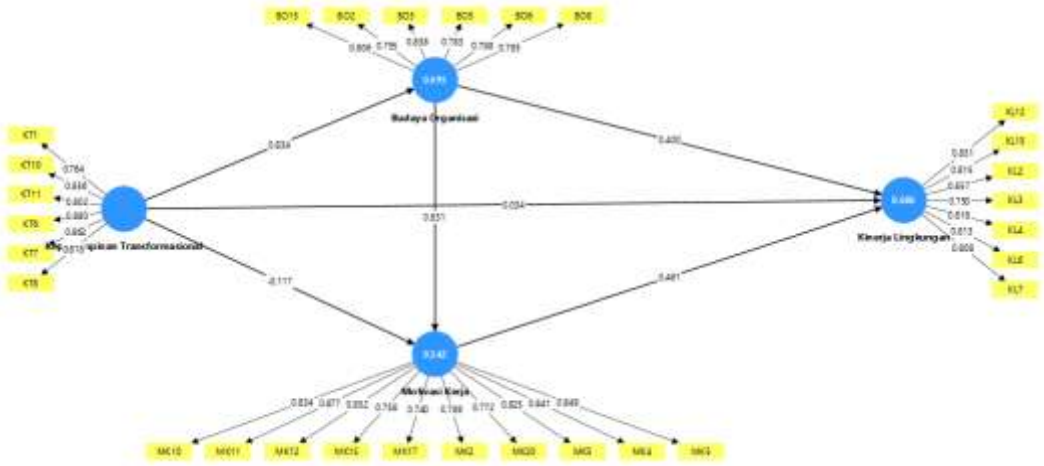
Table 3. R Square Test Results (R2)

Variable	R-square	Adjusted R-square
Organizational Culture	0.695	0.690
Environmental Performance	0.686	0.668
Work Motivation	0.542	0.525

Source: (Author, 2026)

The results of the analysis showed that the Organizational Culture had an R^2 value of 0.695 (Adjusted R^2 = 0.690), which means that 69.5% of the variance was explained by exogenous variables, showing a strong predictive contribution. Furthermore, Environmental Performance obtained an R^2 value of 0.686 (Adjusted R^2 = 0.668), indicating that 68.6% of

environmental performance variations can be explained by Organizational Culture, Transformational Leadership, and Work Motivation, with high predictive levels. Meanwhile, Work Motivation had an R^2 value of 0.542 (Adjusted R^2 = 0.525), indicating that 54.2% of the variation was explained by Transformational Leadership and Organizational Culture. Based on the criteria of Hair et al. (2021), the three values are classified as moderate to strong, which confirms that the model has adequate predictive ability in explaining the relationship between variables in the organizational context of PT. MPIE Karawang. Here is a picture of the PLS-SEM output showing the R Square Research.



Gambar 1. Output Model *SEM-PLS Algorithm*

Source: (Author, 2026)

D. *Direct Effect*

Path coefficient analysis is used to test the direct relationship between latent variables in a structural model. The results of the test using the bootstrapping method on SmartPLS show the direction, strength, and significance of the relationship based on the path coefficient (β), *t-statistic*, and *p-value* values.

The following table presents the results of the direct influence testing between the main variables:

Tabel 4. Hasil *Path Coefficient Bootstrapping Direct Effect*

Path Coefficients	Original sample (O)	T statistics (|O/STDEV|)	P value (*P values*)	Status
BO -> KL	0.400	1.507	0.066	Unproven
BO -> MK	0.831	6.034	0.000	Proven
KT -> BO	0.834	22.616	0.000	Proven
KT -> KL	0.034	0.192	0.424	Unproven
KT -> MK	-0.117	0.826	0.204	Unproven
MK -> KL	0.461	2.534	0.006	Proven

Source: (Author, 2026)

The test results showed that Transformational Leadership (KT) had a significant effect on Organizational Culture (BO), and Organizational Culture had a significant effect on Work Motivation (MK). In addition, Work Motivation also has a positive and significant influence on Environmental Performance (KL). However, the direct influence of Transformational Leadership on Work Motivation and Environmental Performance, as well as the influence of

Organizational Culture on Environmental Performance, has not been proven to be significant. This shows that the mechanism of the relationship between variables is more dominant through mediation than direct relationships.

E. *Indirect Effect*

Indirect influence analysis was performed to identify the role of mediating variables in bridging the relationship between exogenous and endogenous variables. The *bootstrapping test* on SmartPLS was used to assess the significance of the mediation path based on the path coefficient (β), *t-statistic*, and *p-value* values.

Tabel 5. Hasil *Path Coefficient Bootstrapping Indirect Effect*

Path Coefficients	Original sample (O)	T statistics (|O/STDEV|)	P value (P values)	Status
KT -> BO -> MK -> KL	0.319	1.917	0.028	Proven
KT -> BO -> KL	0.334	1.493	0.068	Unproven
KT -> BO -> MK	0.693	5.458	0.000	Proven
BO -> MK -> KL	0.383	1.993	0.023	Proven
KT-> MK-> KL	-0.054	0.669	0.252	Unproven

Source: (Author, 2026)

The results of the test showed that there were three mediation paths that proved to be significant, namely Transformational Leadership → Organizational Culture → Work Motivation → Environmental Performance, Transformational Leadership → Organizational Culture → Work Motivation, and Organizational Culture → Work Motivation → Environmental Performance. This confirms that Organizational Culture and Work Motivation play an important role as mediators that strengthen the influence of Transformational Leadership on Environmental Performance. Thus, the relationship between variables in the model is more indirect through value and motivation mechanisms, rather than direct influences.

F. Hypothesis Testing

Hypothesis tests are carried out to confirm the relationships between variables in structural models, either directly or indirectly. This test uses the bootstrapping method on SmartPLS by considering t-statistical and p-value values at a significance level of 0.05. The hypothesis is stated to be accepted if the t-statistical value is > 1.96 and the p-value is < 0.05, and rejected if it does not meet these criteria.

Table 6. Research Hypothesis Testing Results

	Hypothesis	Direct/Indirect	Status
H1	Transformational leadership style has a positive influence on organizational culture	Live	**Accepted** (because T = 22,616; P = 0.000 — significant)
H2	Transformational leadership style has a positive influence on work motivation	Live	**Rejected** (because T = 0.826; P = 0.204 — insignificant)
H3	Organizational culture has a positive influence on work motivation	Live	**Accepted**

			(because T = 6.034; P = 0.000 — significant)
H4	Organizational culture has a positive influence on environmental performance	Live	**Rejected** (because T = 1.507; P = 0.066 — insignificant)
H5	Work motivation has a positive influence on environmental performance	Live	**Accepted** (because T = 2.534; P = 0.006 — significant)
H6	Transformational leadership style has a positive influence on environmental performance	Live	**Rejected** (because T = 0.192; P = 0.424 — insignificant)
H7	Transformational leadership style has a positive influence on environmental performance through work motivation	Indirect	**Rejected** (because T = 0.669; P = 0.252 — insignificant)
H8	Organizational culture and employee motivation together have a positive influence on environmental performance	Indirect	**Accepted** (because the Organizational Culture → Work Motivation → Environmental Performance pathways are significant; T = 1.993; P = 0.023)

Source: (Author, 2026)

The test results showed that three direct hypotheses (H1, H3, H5) and one indirect hypothesis (H8) were declared significant. This indicates that transformational leadership has a strong effect on organizational culture, which in turn increases work motivation, and ultimately has a positive impact on environmental performance. Thus, organizational culture and work motivation have proven to play an important role as a mediation mechanism in bridging the influence of leadership on environmental performance at PT. MPIE Karawang.

This section presents the results of empirical analysis and theoretical interpretation of the relationship between transformational leadership, organizational culture, work motivation, and environmental performance using the PLS-SEM approach. The analysis was carried out on direct and indirect effects, and was associated with relevant theories such as Transformational Leadership Theory (Bass & Riggio, 2006), Organizational Culture Theory (Schein, 2010), and Theory of Planned Behavior (Ajzen, 1991).

The test results showed that transformational leadership had a positive and significant effect on organizational culture (β = 0.834; T = 22,616; P = 0.000). These findings confirm that leaders play the role of cultural architects who instill collective values, norms, and behaviors, thereby strengthening organizational cohesion and identity. At PT. Maligi Permata Industrial Estate (MPIE) Karawang, a transformational leader has proven to be effective in building a collaborative and sustainability-oriented work culture.

However, transformational leadership had no direct effect on work motivation or environmental performance (β = –0.117; T = 0.826; P = 0.204 and β = 0.034; T = 0.192; P = 0.424). This means that the influence of leadership on employee behavior does not occur spontaneously, but through the process of internalizing values and forming a supportive cultural system. This shows that leadership functions as a value driver that creates organizational conditions conducive to the growth of work motivation, not as a direct driver of individual behavior. Furthermore, organizational culture had a positive and significant effect on work motivation (β = 0.831; T = 6.034; P = 0.000), which indicates that a strong value

system is able to foster a sense of belonging, commitment, and work ethic among employees. An inclusive and sustainability-oriented work culture creates a psychological climate that encourages employees to contribute optimally to the organization's goals.

Meanwhile, organizational culture had a positive but insignificant effect on environmental performance (β = 0.400; T = 1.507; P = 0.066). This shows that although sustainability values have been embedded, their impact on environmental behavior is not fully optimal without motivational encouragement and strong managerial system support. Therefore, organizational culture serves as a foundation of values, but it requires reinforcing factors such as work motivation to be able to produce real ecological behavior changes. The results of the study also showed that work motivation had a positive and significant effect on environmental performance (β = 0.461; T = 2.534; P = 0.006). These findings reinforce that intrinsically motivated employees tend to be more concerned about energy efficiency, waste management, and the implementation of sustainability practices in their work. Work motivation here serves as a psychological catalyst that translates organizational values into concrete actions towards environmental sustainability.

In terms of indirect relationships, it was found that there are significant double mediation mechanisms (serial mediation), namely:

1. Transformational Leadership → Organizational Culture → Work Motivation → Environmental Performance (β = 0.319; P = 0.028),
2. Organizational Culture → Work Motivation → Environmental Performance (β = 0.383; P = 0.023).

These results confirm that transformational leadership improves environmental performance through the formation of organizational culture and increased employee work motivation. This means that leaders play a role in building sustainability values (organizational culture enabler), organizational culture creates conducive norms and work climate, while work motivation is a behavioral driver that encourages pro-environmental behavior. Theoretically, these results reinforce the view that transformational leadership has systemic and mediative influences on organizational performance (Podsakoff et al., 1996; Boiral & Paillé, 2012). Practically, for PT. MPIE, this shows that improving environmental performance cannot be achieved only through policy or technology, but through a transformation of values, culture, and human spirit that encourages sustainable behavior across organizational lines.

CONCLUSION

The results of quantitative analysis and conceptual discussion show that transformational leadership, organizational culture, work motivation, and environmental performance have a systemic and mutually reinforcing relationship in building organizational sustainability in PT. Maligi Permata Industrial Estate (MPIE) Karawang. The relationship between variables is not only structural, but also functional reflecting the value-building, behavioral, and motivational mechanisms that support the creation of sustainable environmental performance. Empirically, transformational leadership has a positive and significant effect on organizational culture (β= 0.834; P= 0.000), confirms that visionary and inspirational leaders are able to instill shared values and form a collaborative and sustainability-oriented work culture. However, the influence of leadership on work motivation and environmental performance is indirect, working through the formation of organizational values and increasing employee motivation.

Furthermore, organizational culture had a positive and significant effect on work motivation (β= 0.831; P= 0.000), shows that cohesive and inclusive values are able to foster enthusiasm, commitment, and loyalty to the organization's vision. Although cultural influence on environmental performance was not directly significant (β= 0.400; P= 0.066), its role remains fundamental as a normative foundation that gives direction to pro-environmental behavior. Meanwhile, work motivation was shown to have a positive and significant effect on environmental performance (β= 0.461; P = 0.006). Intrinsically motivated employees demonstrate active participation in energy efficiency, waste management, and compliance with the company's sustainability policies. Furthermore, the results of the mediation test confirmed the existence of a dual mediation mechanism (serial mediation) where transformational leadership influences environmental performance through the formation of organizational culture and increased work motivation (β= 0.319; P = 0.028). Thus, transformational leadership functions as a catalyst for values, organizational culture as a forum for internalization, and work motivation as a driver of ecological behavior. Overall, these findings confirm that sustainable environmental performance does not depend solely on green policies or technologies, but on the synergy between organizational values, individual motivation, and collective awareness of ecological responsibility. The success of environmental management at PT. MPIE Karawang is a reflection of the cultural transformation and human consciousness that underlies modern industrial sustainability practices.

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