

ORIGINAL

The impact of environmental auditing and environmental management practices on environmental performance: the mediating role of top management support

Impacto de la auditoría ambiental y de las prácticas de gestión ambiental sobre el desempeño ambiental: el rol mediador del apoyo de la alta dirección

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ABSTRACT

Introduction: this study investigated the relationships among environmental auditing (EA), environmental management practices (EMP), and environmental performance (EP), with a particular emphasis on the mediating role of top management support (TMS). It addressed the limited understanding of how governance tools and operational practices translate into measurable sustainability outcomes, especially in emerging market contexts.

Method: data were collected via survey and analyzed using PLS-SEM to test direct and mediating effects.

Results: the analysis confirmed that both EA and EMP positively influenced EP. However, their direct effects were relatively modest, and their impact was significantly enhanced through TMS. The findings demonstrated that TMS strengthened the effectiveness of environmental initiatives, enabling the transformation of compliance-oriented activities into strategic performance improvements.

Conclusions: the study contributed to sustainability governance literature by integrating governance mechanisms, operational practices, and leadership commitment into a unified framework. From a practical standpoint, the results underscored the importance of visible executive engagement for organizations seeking to achieve both environmental accountability and competitive advantage.

Keywords: Environmental Auditing; Environmental Management Practices; Top Management Support; Environmental Performance; Sustainability Governance.

RESUMEN

Introducción: este estudio investigó las relaciones entre la auditoría ambiental (EA), las prácticas de gestión ambiental (EMP) y el desempeño ambiental (EP), con un énfasis particular en el papel mediador del apoyo de la alta dirección (TMS). Abordó la comprensión limitada de cómo las herramientas de gobernanza y las prácticas operativas se traducen en resultados de sostenibilidad medibles, especialmente en contextos de mercados emergentes.

Métodos: los datos se recopilaron mediante encuestas y se analizaron utilizando PLS-SEM para probar los efectos directos y mediadores.

Resultados: el análisis confirmó que tanto la EA como la EMP influyeron positivamente en el EP. Sin embargo, sus efectos directos fueron relativamente modestos y su impacto se vio significativamente reforzado a través del TMS. Los resultados demostraron que el TMS fortaleció la efectividad de las iniciativas ambientales, permitiendo la transformación de las actividades orientadas al cumplimiento en mejoras estratégicas del desempeño.

Conclusiones: el estudio contribuyó a la literatura sobre gobernanza de la sostenibilidad al integrar

mecanismos de gobernanza, prácticas operativas y compromiso del liderazgo en un marco unificado. Desde una perspectiva práctica, los resultados destacaron la importancia de la participación visible de la alta dirección para las organizaciones que buscan lograr tanto la responsabilidad ambiental como la ventaja competitiva.

Palabras clave: Auditoría Ambiental; Prácticas de Gestión Ambiental; Apoyo de la Alta Dirección; Desempeño Ambiental; Gobernanza de la Sostenibilidad.

INTRODUCTION

In recent decades, intensifying environmental challenges and global sustainability agendas have placed increasing pressure on firms to demonstrate accountability for their ecological impacts. Corporations are expected to comply with regulations and contribute to SDGs by embedding environmental factors into strategic decisions.^(1,2,3,4) Against this backdrop, environmental performance (EP) has emerged as a crucial benchmark of organizational sustainability, reflecting a firm's ability to minimize ecological harm, optimize resource efficiency, and meet stakeholder expectations.^(5,6)

Two mechanisms have been widely recognized for shaping EP: environmental auditing (EA) and environmental management practices (EMP). EA provides systematic assessments of compliance, risks, and environmental outcomes, reinforcing transparency and credibility in corporate operations.^(7,8,9) EMP, on the other hand, refers to operational and strategic initiatives—such as green supply chain management, waste reduction, and eco-efficiency programs—that align day-to-day activities with long-term sustainability goals.^(10,11,12,13) Prior studies have confirmed the positive role of EA and EMP in improving EP; however, the literature remains inconsistent, and the mechanisms through which these practices influence performance are still debated.^(14,15)

A critical yet underexplored factor in this relationship is top management support (TMS). Senior executives play a decisive role in prioritizing environmental initiatives, allocating resources, and embedding sustainability into organizational culture.^(16,17) Without active support from top management, even robust audits or management practices may fail to achieve meaningful outcomes. Despite its importance, the mediating role of TMS between EA, EMP, and EP has not been sufficiently addressed in the literature, especially in emerging economies where institutional support for sustainability is still evolving.^(18,19)

This study seeks to address these gaps by empirically investigating the relationships among EA, EMP, and EP, with a particular focus on the mediating role of TMS. Guided by stakeholder and resource-based perspectives, the research is driven by three main objectives:

1. To assess the direct effects of EA and EMP on EP.
2. To examine the influence of EA and EMP on TMS.
3. To analyze the mediating role of TMS in linking EA and EMP with EP.

To achieve these objectives, the study employs PLS-SEM. This method is well suited for analyzing complex models with mediating effects, predictive orientation, and non-normal data, making it particularly appropriate for survey-based research in emerging market contexts.⁽²⁰⁾

From a theoretical perspective, this research contributes to the literature on sustainability governance by integrating EA, EMP, and TMS into a unified framework for explaining EP outcomes. It extends prior studies that typically examined these constructs in isolation, highlighting their interdependencies and the enabling role of leadership.^(4,9) From a practical perspective, the findings provide actionable insights for managers and policymakers seeking to enhance environmental accountability and competitiveness. By demonstrating that EA and EMP are most effective when supported by top management, this study underscores the strategic importance of leadership commitment in advancing corporate sustainability.

METHOD

Conceptual framework

This study proposes a conceptual framework to examine how EA and EMP influence EP, with the mediating role of TMS. In light of rising environmental concerns and stakeholder pressures, organizations face growing pressure not only to implement sustainable practices but also to ensure that such practices translate into measurable outcomes. The framework integrates governance mechanisms, operational strategies, leadership commitment, and sustainability outcomes to provide a comprehensive view of corporate EP.

This framework positions EA as a tool that emphasizes compliance and accountability. EA systematically evaluates environmental policies, regulatory adherence, and risk management activities.⁽⁷⁾ Through these assessments, it helps firms detect inefficiencies, address non-compliance, and improve transparency.⁽⁸⁾ Prior

research shows that well-designed audit procedures strengthen stakeholder legitimacy and foster more credible sustainability reporting.^(21,22,23) Within this framework, EA enhances EP by ensuring effective environmental risk management and providing a structured mechanism for continuous improvement.

EMP represent proactive measures taken to integrate sustainability into organizational processes and culture. EMP include waste reduction initiatives, energy-saving technologies, pollution control, and green supply chain management.^(10,12,24) These practices provide firms with tangible methods to reduce environmental impact, foster eco-efficiency, and encourage innovation.^(11,25) Studies have demonstrated that EMP contribute to both operational efficiency and enhanced stakeholder trust, positioning them as a strategic driver of environmental and competitive performance.^(15,26,27) In the proposed framework, EMP are theorized to positively influence EP by creating a sustainable foundation for long-term growth.

TMS is integrated into the framework as a mediating construct that ensures environmental practices are successfully implemented and translated into performance outcomes. TMS reflects the commitment of senior leaders to environmental goals, including the allocation of resources, the establishment of clear policies, and the integration of sustainability into corporate strategy.⁽¹⁴⁾ Evidence suggests that leadership involvement amplifies the effectiveness of both audits and management practices by legitimizing initiatives, encouraging cross-departmental cooperation, and embedding environmental values into organizational culture.^(16,17,28) Without active TMS, EA and EMP may be symbolic or fragmented, delivering limited results. Therefore, in this framework, TMS serves as a mechanism that facilitates the translation of environmental initiatives into concrete performance improvements.

At the center of the model is EP, which reflects the extent to which organizations minimize environmental harm and optimize sustainability outcomes. EP can be measured through indicators such as emissions reduction, waste management, energy efficiency, regulatory compliance, and adoption of clean technologies.^(3,5,14,29) Strong EP outcomes not only mitigate environmental risks but also enhance corporate reputation, stakeholder legitimacy, and financial resilience.^(1,30) In this framework, EP serves as both the dependent outcome of EA and EMP and the ultimate indicator of how effectively organizations respond to sustainability challenges.

The integration of these constructs underscores that while EA and EMP provide essential mechanisms and practices, their effectiveness depends on the extent of leadership commitment. TMS ensures that audits and practices are adequately resourced, strategically aligned, and internalized across the organization. Thus, the framework posits that EA and EMP influence EP both directly and indirectly through TMS.^(4,6,9)

To empirically validate this framework, the study applies PLS-SEM. This method enables the simultaneous assessment of direct effects, indirect effects, and mediation pathways, making it suitable for complex models involving multiple constructs and relationships.⁽²⁰⁾ By testing this framework in the context of emerging markets, the study seeks to provide new insights into how governance, management, and leadership interact to shape corporate EP.^(30,31)

Foundational theory

The Resource-Based View

The Resource-Based View (RBV) posits that a firm's internal resources and capabilities are the primary sources of sustainable competitive advantage. Resources that are valuable, rare, inimitable, and non-substitutable (VRIN) allow firms to outperform competitors and achieve superior long-term outcomes.⁽³²⁾ In the context of environmental management, capabilities such as the ability to reduce waste, optimize resource use, and integrate sustainability into daily operations can be considered strategic assets that enhance organizational performance.⁽³¹⁾

Within this study, EMP are viewed as internal resources that contribute to a firm's EP. Practices such as pollution prevention, eco-efficiency, and green supply chain management enable firms to lower costs, improve operational efficiency, and foster innovation, while simultaneously addressing environmental concerns.^(11,12,15) According to RBV, these practices satisfy the VRIN criteria because they are often firm-specific, path-dependent, and embedded in organizational processes, making them difficult for competitors to replicate.

Empirical evidence supports this view, showing that companies with advanced environmental management systems not only achieve better environmental outcomes but also benefit from enhanced reputation and financial performance.^(1,5,24) By treating EMP as internal capabilities, RBV helps explain why firms that strategically invest in sustainability practices are more likely to demonstrate superior EP.

In addition, RBV provides a rationale for considering EP as the manifestation of these internal capabilities. EP represents the outcomes of firms' investments in environmental practices, including emissions reduction, resource efficiency, and regulatory compliance. In this sense, EP serves as evidence that EMP function as valuable resources, transforming environmental initiatives into measurable advantages.^(4,9)

Thus, RBV highlights the internal drivers of the proposed model, explaining how EMP enhance EP by leveraging firm-specific capabilities that align sustainability with competitive advantage.

Institutional theory

Institutional theory explains how organizations are shaped by the norms, regulations, and expectations of their institutional environment. Firms often adopt practices not solely for efficiency gains but also to secure legitimacy, comply with regulatory requirements, and align with prevailing industry standards.⁽³³⁾ According to the framework of institutional isomorphism, companies respond to coercive pressures from regulators, normative pressures from professional associations, and mimetic pressures from leading firms within the same sector.^(34,35)

In the environmental domain, these institutional pressures have intensified due to global attention on climate change, biodiversity loss, and sustainable development. As a result, firms increasingly adopt EA as a mechanism to demonstrate accountability, strengthen compliance, and signal commitment to sustainability. EA provides systematic evaluations of environmental policies and practices, ensuring adherence to regulatory standards and enhancing organizational legitimacy.^(7,8)

Empirical studies confirm that environmental audits are often introduced as a response to regulatory demands or stakeholder scrutiny rather than voluntary efficiency-driven initiatives.^(6,21,36) For instance, governments and international organizations have encouraged environmental audits as part of mandatory disclosure frameworks, reinforcing their role as institutionalized practices that promote transparency and comparability across industries.⁽³⁷⁾

Within this study's framework, institutional theory provides the rationale for linking EA to EP. By complying with institutional pressures, firms conduct audits that identify non-compliance issues, inefficiencies, and environmental risks, which in turn facilitates corrective action and measurable improvements in EP. Moreover, the institutionalization of auditing standards fosters greater uniformity in EP metrics, making it easier for firms to benchmark themselves against peers and align with international reporting initiatives.^(22,23)

Thus, institutional theory underscores that the adoption of EA is not merely a technical choice but also a socially and legally embedded practice. It highlights the external drivers of the model, explaining why firms adopt environmental auditing to enhance legitimacy and ultimately improve EP.

Stakeholder theory

Stakeholder theory, introduced by Freeman⁽³⁸⁾ and further developed by subsequent scholars, emphasizes that firms are accountable not only to shareholders but also to a broad range of stakeholders, including employees, customers, regulators, communities, and the natural environment. In the sustainability domain, stakeholder demands have become a critical driver of corporate environmental strategies, compelling firms to adopt practices that demonstrate transparency, accountability, and ecological stewardship.⁽³⁹⁾

In this study, TMS is conceptualized as the mechanism through which firms respond effectively to stakeholder pressures. Senior executives play a central role in balancing stakeholder expectations, allocating resources, and legitimizing environmental initiatives.^(14,40) By visibly endorsing sustainability objectives, top managers signal commitment both internally and externally, ensuring that EA and EMP are not symbolic gestures but strategic drivers of performance outcomes.^(16,17,28)

Stakeholder theory also explains the mediating role of TMS in the proposed framework. While EA and EMP provide technical tools and operational practices, their effectiveness in improving EP depends on leadership commitment to stakeholder-responsive decision-making. For example, regulators may demand stricter compliance, communities may expect reductions in emissions, and investors may prioritize firms with credible environmental disclosures. TMS aligns these diverse expectations with corporate strategy, thereby enhancing the credibility and impact of environmental initiatives.^(19,30)

Thus, stakeholder theory provides the rationale for integrating TMS into the conceptual framework. It highlights that EP is not only the outcome of internal practices but also a reflection of how well firms respond to the demands of multiple stakeholders through visible leadership support. By embedding sustainability into organizational culture and governance, top managers ensure that environmental practices translate into tangible improvements in performance and legitimacy.

In conclusion, the foundational theories underpinning this study provide a comprehensive framework for understanding the drivers and outcomes of corporate environmental practices. RBV explains how EMP function as valuable organizational capabilities that enhance EP. Institutional theory situates EA within the broader regulatory and normative environment, highlighting the role of compliance and legitimacy pressures in shaping environmental outcomes. Stakeholder theory emphasizes the importance of responsiveness to diverse stakeholder demands, positioning TMS as the mediating mechanism that ensures environmental initiatives translate into meaningful performance improvements.

Together, these theories offer an integrated explanation of the proposed conceptual model, where EA and EMP serve as internal and external practices, TMS acts as a leadership-driven enabler, and EP reflects the ultimate outcome of organizational sustainability efforts. By combining internal capabilities, external pressures, and stakeholder responsiveness, the framework provides a robust theoretical foundation for analyzing how firms achieve superior EP.^(31,34,35)

Research hypotheses

This study investigates how EA and EMP affect EP, while also examining the mediating role of TMS. EA represents a compliance-oriented mechanism that ensures accountability and regulatory adherence, whereas EMP capture proactive initiatives that integrate sustainability into organizational processes. EP is conceptualized as the ultimate outcome, reflecting how effectively firms reduce emissions, manage resources, and adopt clean technologies. TMS is introduced as a mediating factor that translates environmental initiatives into measurable outcomes by ensuring strategic alignment, resource allocation, and stakeholder responsiveness.

The hypotheses below explore the direct effects of EA and EMP on EP, as well as the mediating role of TMS in strengthening these relationships.

The influence of environmental auditing on environmental performance

EA is widely regarded as a fundamental mechanism for assessing a firm's compliance with environmental regulations and its ability to identify ecological risks. By systematically monitoring processes, emissions, and resource usage, EA enables organizations to detect inefficiencies, strengthen accountability, and implement corrective actions.^(7,8,22) Similar to other performance monitoring tools, EA operates on the principle that improvement requires measurement, verification, and feedback. When effectively implemented, environmental audits provide firms with the necessary information to minimize environmental harm and improve decision-making in sustainability management.^(21,37)

From an institutional theory perspective, EA reflects the firm's response to coercive, normative, and mimetic pressures in the organizational environment. Regulators, industry associations, and peer companies all exert influence, prompting firms to adopt auditing as a means of securing legitimacy.⁽⁶⁾ By meeting these institutional expectations, EA not only ensures compliance but also strengthens corporate credibility and stakeholder trust.⁽²³⁾

At the same time, EA can be interpreted through stakeholder theory as a tool for enhancing transparency and communication. Regular audits provide credible evidence of EP, which can be disclosed to regulators, investors, and communities. This enhances trust in the firm's sustainability claims, particularly in contexts where external stakeholders demand higher levels of accountability.^(9,19)

However, prior research also highlights potential limitations of EA. Critics argue that in some cases audits may become symbolic, conducted merely to satisfy regulatory requirements without leading to genuine environmental improvements.⁽³⁶⁾ When audits are superficial or poorly integrated into broader management systems, their impact on EP may be minimal. These concerns suggest that while EA has the potential to strengthen EP, its effectiveness depends on both managerial commitment and the integration of findings into strategic actions.⁽⁴⁾

H1: EA positively influence EP.

The influence of environmental management practices on environmental performance

EMP refer to proactive initiatives aimed at reducing environmental impacts and integrating sustainability into organizational operations. These practices include waste reduction, pollution prevention, eco-design, resource conservation, and green supply chain management.^(10,11,12,24) By embedding sustainability at the operational level, EMP allow firms to reduce costs, improve efficiency, and foster innovation while simultaneously addressing environmental concerns.⁽²⁵⁾

From a resource-based view (RBV) perspective, EMP can be regarded as strategic capabilities that satisfy the VRIN criteria—valuable, rare, inimitable, and non-substitutable. Firms that effectively develop environmental competencies gain competitive advantage through superior EP, operational resilience, and reputational benefits.^(5,39,40) EMP thus represent internal resources that enable firms to outperform competitors in both ecological and economic terms.

EMP are also closely connected to stakeholder expectations. Customers, investors, and communities increasingly demand evidence of sustainable practices, and firms that adopt EMP are better positioned to meet these demands.^(15,27) By reducing emissions, conserving resources, and implementing cleaner technologies, firms not only achieve higher EP but also reinforce legitimacy and stakeholder trust.

Despite their potential, some scholars caution that EMP do not always guarantee superior performance. In certain contexts, firms adopt EMP in a symbolic or fragmented way, driven by reputational concerns rather than genuine environmental goals.^(24,26,27) In such cases, EMP may generate limited environmental improvements and could even result in accusations of greenwashing. These challenges suggest that the effectiveness of EMP depends on the extent to which practices are systematically embedded and continuously supported within the organization.

H2: EMP positively influence EP.

The influence of environmental auditing on top management support

EA not only functions as a compliance mechanism but also serves as an internal driver of organizational

governance. The process of conducting audits generates critical information on regulatory adherence, environmental risks, and operational inefficiencies that require managerial oversight.^(7,21,41) When firms adopt EA, the findings are often escalated to senior executives, prompting them to evaluate EP, allocate resources, and introduce corrective strategies. In this way, EA acts as a trigger for stronger involvement and commitment from top management.⁽²²⁾

From an institutional theory perspective, environmental audits create coercive and normative pressures that flow upward within the organization. Audit outcomes highlight areas of non-compliance and reputational risk, which compel top executives to prioritize environmental initiatives in order to maintain legitimacy.⁽⁶⁾ As a result, leadership support is not only a voluntary response but also a strategic necessity to address institutional demands.

Furthermore, EA can foster stakeholder-oriented governance by providing credible evidence of sustainability practices. The visibility of audit outcomes reinforces the need for executives to signal accountability to external stakeholders, thereby strengthening their role in shaping environmental strategy.^(9,19) By engaging with audit results, top managers demonstrate responsiveness to societal and regulatory expectations, enhancing both internal alignment and external legitimacy.

Nevertheless, some scholars caution that audits may not always result in stronger management support. In cases where audits are treated as symbolic exercises, top executives may downplay their findings or delegate responsibility to lower-level managers, limiting their role in driving organizational change.^(4,36) This suggests that the influence of EA on TMS depends on how audit results are communicated and integrated into corporate decision-making

H3: EA positively influence TMS.

The influence of environmental management practices on top management support

EMP encompass proactive initiatives such as pollution prevention, eco-design, waste minimization, and energy conservation, which require alignment across multiple organizational levels. The successful implementation of these practices often depends on the active commitment and oversight of top management, as executives are responsible for integrating sustainability into corporate strategy and allocating resources to ensure continuity.^(10,11,40)

From a Resource-Based View (RBV), EMP represent internal capabilities that can generate long-term competitive advantage. However, these capabilities require senior leadership to recognize their strategic value and champion their adoption. When executives endorse EMP, they signal that environmental initiatives are not simply operational add-ons but integral to the firm's strategic orientation.^(5,39) Thus, EMP play an enabling role in fostering TMS by demonstrating both ecological and economic benefits.

Stakeholder theory further highlights that the adoption of EMP increases pressure on executives to respond visibly to stakeholder expectations. As firms implement green practices, stakeholders such as investors, regulators, and customers demand evidence of leadership accountability to ensure that initiatives are embedded in long-term strategy rather than short-term campaigns.^(17,19,28) This reinforces the expectation that top managers must take ownership of environmental programs, further strengthening their role in sustainability governance.

Nevertheless, EMP do not always guarantee enhanced management support. In some organizations, green practices are introduced at the operational level without strong strategic alignment, leading to fragmented initiatives and limited executive engagement.^(24,26,27) These cases illustrate that the extent to which EMP foster TMS depends on both the visibility of results and the degree of alignment with corporate objectives.

H4: EMP positively influence TMS.

The influence of top management support on environmental performance

TMS is widely recognized as a critical determinant of successful sustainability initiatives. Senior executives play a pivotal role in setting environmental priorities, allocating resources, and embedding sustainability into corporate strategy.^(14,28) When leadership commitment is strong, environmental objectives are more likely to be translated into concrete policies and practices that improve performance outcomes.

From a stakeholder theory perspective, TMS ensures that organizational responses to stakeholder expectations are credible and visible. By endorsing sustainability initiatives, executives demonstrate accountability to regulators, investors, employees, and communities, thereby strengthening trust and legitimacy.^(19,38,40) Leadership support thus functions as a signaling mechanism that EP is not incidental but strategically embedded in the firm's operations.

Empirical studies further highlight the central role of TMS in achieving superior EP. For example, firms with highly engaged leadership are more likely to implement clean technologies, reduce emissions, and comply with regulatory requirements, resulting in better environmental outcomes.^(16,17,28) Conversely, in the absence of strong managerial commitment, even well-designed environmental audits or practices may fail to achieve

significant improvements, as they lack the necessary strategic reinforcement.⁽³⁶⁾

However, scholars caution that relying solely on executive commitment can create risks if environmental initiatives are not diffused throughout the organization. Over-centralization may hinder employee engagement and reduce organizational learning, thereby limiting the long-term effectiveness of sustainability programs.

⁽¹⁸⁾ This suggests that while TMS is essential, it should be complemented by broad organizational participation.

H5: TMS positively influence EP.

The mediating role of top management support between environmental auditing and environmental performance

While EA provides organizations with systematic evaluations of compliance, risks, and inefficiencies, its effectiveness in driving improved EP often depends on how the results are interpreted and acted upon by senior leadership. Audit findings generate valuable insights, but without the support of top management, they may remain procedural checklists rather than catalysts for meaningful change.^(4,36)

From a stakeholder theory perspective, top management serves as the crucial link between audit outcomes and organizational responsiveness. Executives who engage with audit results can allocate resources, set strategic priorities, and communicate improvements transparently to stakeholders, thereby amplifying the impact of audits on performance outcomes.^(9,14,19) In this sense, TMS transforms audits from technical evaluations into strategic actions that enhance environmental legitimacy and efficiency.

Institutional theory also reinforces this mediating role. As audits expose areas of non-compliance and reputational risk, top executives are compelled to respond in order to maintain legitimacy within their institutional environment.⁽⁶⁾ By legitimizing and implementing corrective measures, TMS ensures that audit insights translate into concrete improvements in EP.

However, research cautions that when audit processes are poorly integrated into managerial decision-making, their influence may remain symbolic, resulting in limited performance gains.^(21,37) This underscores that the mediating role of TMS is critical to realizing the potential benefits of EA.

H6: TMS mediate the relationship between EA and EP.

The mediating role of top management support between environmental management practices and environmental performance

EMP represent proactive initiatives designed to reduce environmental impact and embed sustainability into organizational operations. While EMP have the potential to enhance EP directly, their effectiveness is often contingent upon the extent of TMS. Without leadership engagement, EMP may be implemented in a fragmented or symbolic manner, yielding only marginal improvements.^(24,26)

From a Resource-Based View (RBV) perspective, EMP can be regarded as valuable organizational capabilities. However, these capabilities require top management commitment to be effectively developed, integrated, and leveraged for long-term competitive advantage.^(39,40) Executives are responsible for recognizing the strategic importance of EMP, aligning them with broader organizational goals, and ensuring they receive adequate resources and visibility.⁽¹⁴⁾

Stakeholder theory further highlights the mediating role of TMS in responding to stakeholder expectations. As stakeholders increasingly demand credible evidence of sustainability, leadership support ensures that EMP are communicated effectively and translated into measurable improvements in EP.^(17,19,30) In this sense, TMS not only validates environmental initiatives but also reinforces their contribution to both ecological outcomes and stakeholder trust.

Nonetheless, scholars note that without consistent executive involvement, EMP may risk being perceived as greenwashing or operational add-ons rather than strategic imperatives.^(15,27) This underscores the importance of TMS in bridging the gap between technical practices and performance outcomes.

H7: TMS mediate the relationship between EMP and EP.

Sample and method of data collection

This study employs a quantitative survey-based approach to examine the effects of EA and EMP on EP, with the mediating role of TMS. The sample comprises 298 respondents, who are managers and executives from manufacturing firms listed on Vietnam's stock exchanges (HOSE and HNX). These firms are subject to higher environmental scrutiny and more standardized reporting practices compared to small and medium-sized enterprises (SMEs).

Survey design and instrument development

The survey instrument was developed by adapting measurement items from prior studies in EA, environmental management, leadership support, and EP.^(5,7,14,16) All constructs were operationalized using multiple items measured on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). To ensure content validity, the

questionnaire was reviewed by three academic experts in environmental management and two sustainability managers from the manufacturing sector. Their feedback led to refinements in wording, removal of redundant items, and contextual adjustments for the Vietnamese setting.

Pilot testing

A pilot study was conducted with 20 listed manufacturing firms not included in the final sample. The pilot aimed to evaluate clarity, response time, and internal consistency. Minor modifications were made based on the feedback to improve readability and eliminate ambiguous wording. The pilot results indicated acceptable reliability, confirming that the instrument was suitable for large-scale data collection.

Sampling and data collection

The sampling frame included all manufacturing firms actively listed on the Vietnam Stock Exchange as of 2024. Purposive sampling was applied with three criteria: (i) the firm must be publicly listed, (ii) it must operate in the manufacturing sector, and (iii) it must have valid corporate contact information. Surveys were distributed via email between May and July 2025, and follow-up calls were made to managers and executives (e.g., sustainability managers, finance managers, executive directors) to improve response rates. Respondents were assured of confidentiality to minimize social desirability bias. After excluding incomplete questionnaires, a total of 298 valid responses were retained for analysis, with each respondent representing their firm. Common method bias was addressed following the recommendations of Podsakoff et al.⁽⁴²⁾ which emphasize the use of procedural and statistical controls to minimize potential bias and ensure the robustness of the results.

Theoretical basis for sample size adequacy

The adequacy of the sample size was evaluated based on established PLS-SEM guidelines. According to the 10-times rule, the minimum required sample size should be at least 10 times the maximum number of structural paths directed at a construct.⁽⁴³⁾ In this study, the most complex construct (EP) had three incoming paths, indicating a minimum requirement of 30 cases. More stringent recommendations based on statistical power analysis. Cohen⁽⁴⁴⁾ also suggest that a sample above 150 is sufficient for models of moderate complexity. With 298 valid responses, the sample size comfortably exceeds these requirements, ensuring stable estimates and robust hypothesis testing.

Measurement model reliability and validity

Reliability and validity of the constructs were assessed following standard PLS-SEM procedures. Specifically, indicator reliability was evaluated through outer loadings, internal consistency was assessed using Cronbach's alpha and composite reliability (CR), and convergent validity was examined through average variance extracted (AVE). Discriminant validity was tested using both the Fornell-Larcker criterion and the heterotrait-monotrait (HTMT) ratio. Variance inflation factor (VIF) values were also examined to detect potential multicollinearity. All procedures followed established recommendations for measurement validation in PLS-SEM.⁽⁴³⁾

Analytical method

Data were analyzed using PLS-SEM with SmartPLS 3.0. PLS-SEM was chosen because of its suitability for exploratory and predictive research, its ability to handle complex models with mediating effects, and its robustness with medium sample sizes.^(20,43) A bootstrapping procedure with 5000 subsamples was applied to evaluate the significance of path coefficients and mediating effects.

Research model

Based on the theoretical framework and hypothesis development, this study proposes a research model linking EA and EMP to EP, with TMS acting as a mediating variable.

The model specifies seven hypotheses: the direct effects of EA and EMP on EP (H1, H2), the direct effects of EA and EMP on TMS (H3, H4), the direct effect of TMS on EP (H5), and the mediating roles of TMS in the relationships between EA and EP, and between EMP and EP (H6, H7).

The proposed research model is illustrated in figure 1 below.

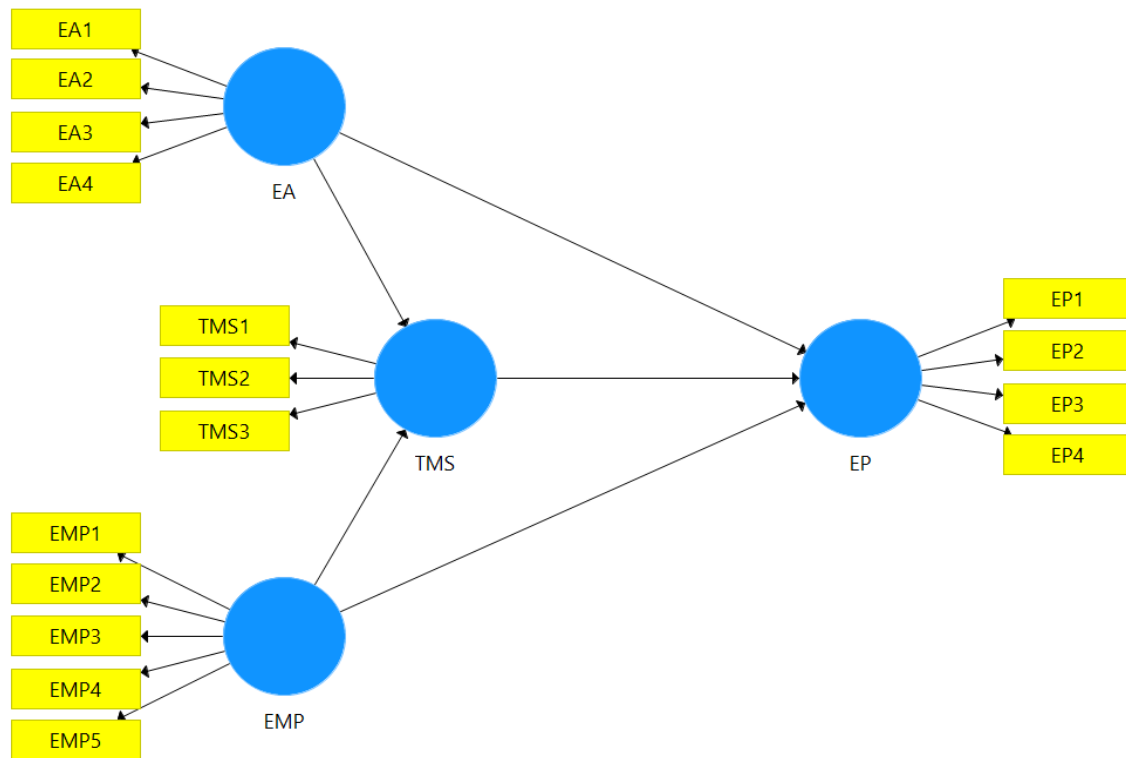


Figure 1. Research model

RESULTS

Measurement model assessment

The data were analyzed using PLS-SEM in SmartPLS 3, following the procedures outlined by Hair et al.⁽²⁰⁾. The measurement model was evaluated in terms of internal consistency, convergent validity, and discriminant validity. Table 1 presents Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) for each construct. Cronbach's alpha and CR values exceeded the recommended threshold of 0,70,^(20,45) indicating adequate reliability, while AVE values were above 0,50, confirming convergent validity.⁽⁴⁶⁾

Construct	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
EA	0,851	0,900	0,692
EMP	0,889	0,918	0,693
TMS	0,842	0,905	0,760
EP	0,842	0,894	0,678

To assess discriminant validity, the Fornell-Larcker criterion was applied. As shown in table 2, the square roots of the AVE values (on the diagonal) were greater than the correlations between constructs, satisfying the criterion for discriminant validity.⁽⁴⁶⁾

Construct	EA	EMP	TMS	EP
EA	0,832			
EMP	0,493	0,832		
TMS	0,622	0,689	0,872	
EP	0,581	0,621	0,663	0,824

Discriminant validity was further verified using the HTMT ratio of correlations. As reported in table 3, all HTMT values were below the conservative threshold of 0,85,⁽⁴⁷⁾ supporting discriminant validity. Even when applying the more liberal cut-off of 0,90, all values remained acceptable.⁽²⁰⁾

Construct	EA	EMP	TMS	EP
EA	-			
EMP	0,566	-		
TMS	0,733	0,796	-	
EP	0,680	0,716	0,784	-

Overall, the measurement model demonstrated adequate reliability and validity. Internal consistency was confirmed by Cronbach's alpha and CR (>0,70), convergent validity was established by AVE (>0,50), and discriminant validity was supported by both the Fornell-Larcker criterion and HTMT ratios (<0,85). These results confirm that the measurement model satisfies the psychometric requirements and is suitable for subsequent structural model assessment.

Structural model assessment

Figure 2 presents the results of the structural model estimated through PLS-SEM, including path coefficients and explained variances (R^2). The R^2 value for TMS is 0,580, indicating that EA and EMP jointly explain 58 % of its variance. The R^2 for EP is 0,527, showing that EA, EMP, and TMS together explain 52,7 % of its variance. Both values exceed the threshold of 0,25,⁽²⁰⁾ suggesting that the model demonstrates satisfactory explanatory power.

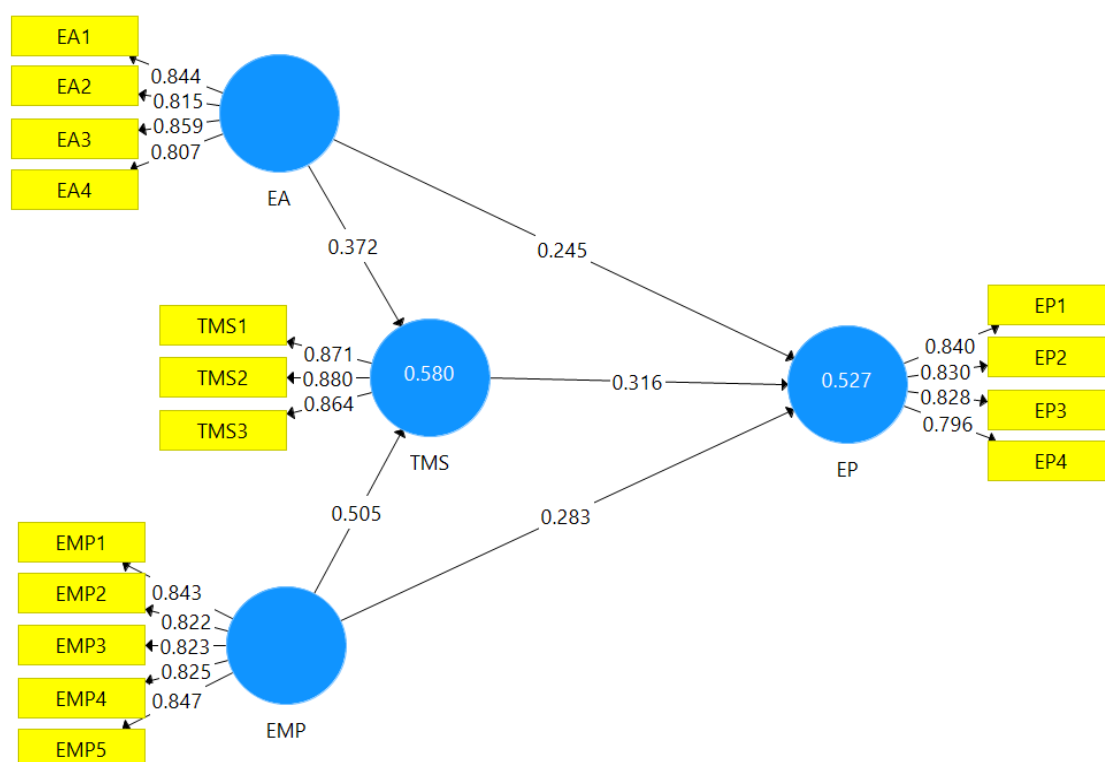


Figure 2. Structural model results

To provide clarity on the explanatory strength of the model, table 4 details the R^2 values for each endogenous construct. According to Chin⁽⁴⁸⁾, R^2 values of 0,25, 0,50, and 0,75 can be considered weak, moderate, and substantial, respectively. The results indicate that the model explains a moderate to substantial proportion of variance in both TMS ($R^2 = 0,580$) and EP ($R^2 = 0,527$).

Construct	R^2	R^2 Adjusted
TMS	0,580	0,577
EP	0,527	0,523

Beyond explanatory power, the effect sizes (f^2) were assessed to capture the individual contribution of each

predictor.⁽⁴⁹⁾ As shown in table 5, EMP exerts a large influence on TMS, while EA demonstrates a medium effect. For EP, EA, EMP, and TMS show small direct effects. These findings suggest that although EMP and EA contribute directly to EP, their impact is relatively modest; instead, their influence is more effectively channeled through TMS. This highlights the central role of TMS as a mediating mechanism in translating environmental audits and management practices into superior EP.

Table 5. Effect size (f^2) for each path		
Relationship	f^2	Effect size
EA → TMS	0,250	Medium
EMP → TMS	0,460	Large
EA → EP	0,077	Small
EMP → EP	0,088	Small
TMS → EP	0,089	Small

While explanatory power (R^2) reflects the fit of the model to the observed data, predictive relevance (Q^2) indicates the model's ability to forecast the values of endogenous constructs. Using the blindfolding procedure, all Q^2 values were positive. As shown in table 6, both TMS ($Q^2 = 0,436$) and EP ($Q^2 = 0,350$) exceed the 0,35 benchmark, indicating large predictive relevance. This confirms that the model is not only explanatory but also predictive.

Table 6. Predictive relevance (Q^2 values)		
Construct	Q^2	Predictive relevance
TMS	0,436	Yes
EP	0,350	Yes

The ultimate test of the structural model involves examining the hypothesized relationships. Table 7 presents the standardized path coefficients, t-values, and p-values based on bootstrapping with 5000 resamples. The results confirm significant direct effects of EA and EMP on both TMS and EP, with TMS itself exerting a moderate influence on EP. Moreover, the indirect pathways (EA → TMS → EP and EMP → TMS → EP) are statistically significant, supporting the mediating role of TMS. Since both EA and EMP retain significant direct effects on EP alongside the indirect effects, the findings indicate partial mediation rather than full mediation. Overall, these results provide strong empirical validation for the hypothesized framework, underscoring the central importance of TMS in translating environmental practices into improved EP.

Table 7. Path coefficients and hypothesis testing					
Hypothesis	Path	β	t-value	p-value	Result
H1	EA → EP	0,245	4,361	0,000	Supported
H2	EMP → EP	0,283	4,672	0,000	Supported
H3	EA → TMS	0,372	9,159	0,000	Supported
H4	EMP → TMS	0,505	12,110	0,000	Supported
H5	TMS → EP	0,316	4,747	0,000	Supported
H6	EA → TMS → EP	0,118	4,108	0,000	Supported
H7	EMP → TMS → EP	0,160	4,632	0,000	Supported

DISCUSSION

Discussion of key findings

The study confirms that both EA and EMP positively influence EP. However, the direct effects are relatively modest, suggesting that these practices alone may not guarantee substantial improvements. This result echoes earlier concerns that environmental initiatives can remain symbolic if not strategically embedded.⁽³⁶⁾ The analysis further shows that TMS plays a central role: not only does it exert a direct effect on EP, but it also mediates the influence of EA and EMP. This finding aligns with prior studies that emphasized the catalytic role of leadership in embedding sustainability values within organizations.^(14,17) The evidence that TMS strengthens the effect of EMP more than EA highlights that executive commitment is particularly critical for resource-intensive and innovation-driven practices.⁽¹⁹⁾

Theoretical implications

This research advances sustainability governance literature by integrating governance mechanisms, operational practices, and leadership commitment into a unified framework. From the resource-based view, EMP are positioned as strategic capabilities, yet their value is fully realized only when supported by executive leadership. Institutional theory is reinforced by showing that audits are not merely compliance tools but can drive performance when legitimized and acted upon by top management. Stakeholder theory is extended by demonstrating empirically that TMS acts as the link between environmental practices and stakeholder-responsive outcomes. Together, these contributions highlight that leadership is not simply an antecedent variable but a mediating mechanism essential to the effectiveness of environmental practices.

Practical and policy implications

For managers, the findings suggest that adopting audits and green practices is insufficient without visible and sustained executive commitment. Leadership engagement ensures that environmental initiatives receive resources, cross-functional collaboration, and integration into corporate strategy, thereby translating into measurable outcomes. For policymakers, the results underscore the importance of designing programs that build sustainability leadership capacity, particularly in emerging markets where institutional pressures are weaker. Encouraging executive-level accountability and embedding sustainability into corporate governance codes could help ensure that environmental practices achieve both ecological improvements and competitive advantages.

Limitations and future research directions

Like any empirical study, this research is subject to certain limitations. First, the data were collected through self-reported surveys, which may introduce common method bias despite the use of established validation procedures. Future studies could complement survey data with archival measures or third-party assessments of environmental performance. Second, the cross-sectional design limits the ability to capture long-term dynamics. Longitudinal studies would be valuable to observe how leadership commitment and environmental practices evolve over time. Third, the focus on firms in a single emerging economy constrains the generalizability of the findings. Comparative studies across different institutional contexts would enrich understanding of how external pressures interact with leadership to shape environmental outcomes. Finally, future research could extend the framework by considering additional mediating or moderating variables, such as employee engagement, technological innovation, or industry-specific factors, to capture a more comprehensive picture of sustainability governance.

CONCLUSIONS

This research demonstrates that EA and EMP improve EP, but their impact is significantly strengthened when supported by TMS. Leadership commitment therefore emerges as the decisive mechanism that translates environmental initiatives into meaningful outcomes. The study contributes to sustainability governance literature by integrating governance mechanisms, operational practices, and leadership engagement into a unified explanatory framework. For practice, the findings suggest that firms in emerging markets should move beyond adopting audits and green practices as formalities and cultivate visible executive commitment to achieve both ecological improvements and competitive advantage.

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