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ENHANCING ESG PERFORMANCE IN VIETNAM'S CONSTRUCTION INDUSTRY: THE ROLE OF ENERGY EFFICIENCY AND GREEN TAX POLICIES

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Abstract

This study investigates the relationship between energy efficiency, green tax policies, and ESG (Environmental, Social, and Governance) performance within Vietnam's construction industry. Using a structural equation modeling (PLS-SEM) approach, survey data collected from managers and key employees in 41 construction SMEs reveals that energy efficiency positively impacts environmental, social, and governance performance. Furthermore, green tax compliance strengthens environmental outcomes, although its direct influence on governance performance is statistically insignificant. The interaction between green tax and energy efficiency significantly enhances environmental performance, underscoring the importance of integrating financial and operational strategies. These findings contribute to the theoretical understanding of ESG by demonstrating the combined effects of technical and fiscal measures on sustainable business practices. Practically, they offer insights for policymakers and construction firms aiming to align corporate strategies with Vietnam's national green growth goals and international climate commitments.

Keywords: Energy Efficiency, Green Tax, ESG Performance, Sustainable Construction, Vietnam Construction Industry

1. INTRODUCTION

In the global effort to combat climate change, the integration of green taxation policies, Environmental, Social, and Governance (ESG) standards, and Corporate Social Responsibility (CSR) frameworks has become increasingly significant. Numerous countries worldwide have established legal systems regulating green taxes, with the European Union leading the way by implementing carbon taxes and promoting energy efficiency initiatives. These regulations not only encourage businesses to reduce their environmental footprint but also promote sustainable practices aligned with ESG and CSR principles, contributing to broader goals of sustainable development. Green taxation acts as a key mechanism to internalize the environmental costs of business activities, encouraging the adoption of cleaner technologies and practices.

In the European Union, green taxes, particularly carbon pricing schemes, have become central to climate policy, with measurable reductions in greenhouse gas emissions and increased corporate ESG disclosures (European Commission, 2022). Similarly, countries such as Sweden, Canada, and Japan have successfully integrated environmental taxes into their economic strategies, aligning taxation with sustainability goals and stakeholder expectations. In these contexts, green taxes are not only instruments of environmental regulation but also strategic levers that push corporations to strengthen governance, improve social performance, and adapt operational strategies in response to evolving ESG norms (OECD, 2022).

In contrast, Vietnam is in the early stages of formalizing a comprehensive green tax framework. The current Environmental Protection Tax Law (No. 57/2010/QH12), which levies taxes on fuel, plastic bags, and hazardous chemicals, represents a foundational step toward integrating environmental pricing into economic planning. However, challenges such as limited scope, weak enforcement mechanisms, and a lack of clear ESG reporting standards continue to hinder progress. Amid Vietnam's commitment to achieve net-zero emissions by 2050 and increasing investor interest in ESG-compliant firms, the development of effective green tax policies aligned with energy efficiency goals has become imperative (Vietnam Ministry of Finance, 2023; VN Net Zero, 2023).

From a corporate perspective, green taxes and energy efficiency initiatives create both opportunities and challenges. On one hand, companies that proactively improve energy performance and align with green fiscal policies can gain competitive advantages, including cost savings, risk mitigation, and enhanced corporate image. On the other hand, poorly designed regulations may increase operational costs and expose firms to compliance risks, especially in sectors with low environmental resilience. Therefore, understanding the mechanisms through which green taxation and energy efficiency jointly influence ESG performance is critical for both businesses and policymakers.

This research aims to fill the gap in the current literature by examining how energy efficiency and green tax policies interact to enhance corporate ESG performance, with a particular focus on three dimensions: environmental, social, and governance. The study also explores how green tax serves as a mediating factor in these relationships, offering practical insights for firms seeking to integrate sustainability into core strategies and for governments developing effective regulatory frameworks.

Building on the theoretical background and practical context, this study seeks to answer several critical research questions. First, it investigates the key mechanisms through which energy efficiency and green taxation influence corporate ESG performance. Second, it examines how the combination of green tax compliance and energy efficiency practices impacts the three pillars of ESG: environmental, social, and governance outcomes. Finally, the study explores whether green tax serves as a mediating factor in the relationship between energy efficiency and ESG performance, providing a deeper understanding of how fiscal policies and operational strategies jointly shape corporate sustainability trajectories.

The subject of this research is the relationship between energy efficiency, green taxation, and ESG performance. The study focuses on medium and large enterprises, particularly in emerging markets such as Vietnam, and explores how regulatory frameworks and internal strategies affect environmental sustainability, social responsibility, and corporate governance.

2. LITERATURE REVIEW

2.1 Theoretical background

In the context of globalization and the transition toward a green economy, the relationship between green tax, energy efficiency, and ESG has become increasingly central to corporate sustainable development strategies. Grounded in three theoretical foundations - Pigouvian theory, institutional theory, and stakeholder theory - this study highlights that green taxation functions not only as a financial tool to correct environmentally harmful behaviors but also as a mechanism that incentivizes businesses to adopt cleaner technologies and enhance energy efficiency in order to reduce costs and comply with regulatory requirements. From an institutional perspective, formal institutions such as environmental laws, green tax frameworks, ESG standards, and mandatory reporting systems (e.g., GRI, SASB) shape corporate behavior by imposing compliance obligations while simultaneously encouraging long-term sustainability practices. Informal institutions, including brand reputation, social expectations, and ethical commitments, also significantly influence ESG integration. Improving energy performance and ensuring transparency in ESG practices enable firms not only to meet institutional demands but also to build trust among key stakeholders such as investors, customers, and regulators. Accordingly, green tax and energy efficiency serve not merely as responses to institutional pressures, but as strategic levers for enhancing ESG performance and achieving comprehensive sustainable development.

2.2 Definition

ESG (Environmental, Social, and Governance) represents a comprehensive framework for evaluating corporate performance, extending beyond social responsibility and sustainable development to support risk management and opportunity identification. The environmental pillar focuses on reducing emissions, waste, and resource consumption; the social pillar addresses fair and diverse working conditions, data protection, and community engagement; while the governance pillar emphasizes business ethics, legal compliance, and transparency. ESG is becoming a core strategic element for both investors and enterprises, with widely adopted assessment systems such as GRI, SASB, and indices like DJSI, FTSE4Good, and Vietnam's VNSI. Environmental performance assesses a company's impact on the natural environment, focusing on energy use, emissions, waste, water, and renewable energy adoption, with strong performance

linked to financial outcomes due to stakeholder pressure for climate action (S&P Global, 2023). Social performance relates to a firm's societal impact through labor practices, diversity, human rights, and community engagement, where responsible practices improve brand reputation and reduce risk (GRI, 2023). Governance performance evaluates decision-making structures, transparency, and ethics, with strong governance attracting investors and ensuring stability (OECD, 2022). Integrating ESG into business operations enhances efficiency, mitigates risks, and creates long-term value, while reflecting a company's sustainable governance capacity in an increasingly competitive global market.

Green tax is a financial instrument designed to promote environmentally friendly behavior and penalize polluting activities, based on the "polluter pays" principle (OECD, 2022). It contributes to reducing carbon emissions, improving energy efficiency, minimizing waste, and conserving natural resources. Common types of green taxes include carbon taxes, energy taxes, pollution taxes, waste taxes, and natural resource taxes. Green taxation serves several key purposes: reducing carbon emissions by taxing fossil fuel use to encourage renewable energy adoption (European Commission, 2022), promoting energy efficiency by incentivizing low-energy appliances and eco-friendly infrastructure (World Bank, 2021), supporting waste reduction and circular economy practices by discouraging single-use plastics and non-recyclable materials (Nguyen & Tran, 2022), and ensuring sustainable natural resource management in industries like forestry, mining, and water extraction. In Vietnam, the Environmental Protection Tax Law (No. 57/2010/QH12) imposes levies on gasoline, coal, plastic bags, and hazardous chemicals. However, green taxation also presents challenges related to social equity and industrial competitiveness, requiring well-balanced and transparent policy design (OECD, 2022).

Green efficiency refers to the optimal use of resources to minimize environmental impact while maximizing economic and social benefits (OECD, 2022). It is built upon three main pillars: resource optimization, pollution reduction, and sustainable innovation. Enterprises that adopt green efficiency practices benefit from cost savings, regulatory compliance, improved public image, and enhanced investor appeal. Resource optimization involves minimizing the consumption of raw materials, water, and energy by implementing circular economy strategies such as recycling, reusing, and reducing waste (World Bank, 2021). Pollution reduction is achieved by adopting cleaner production methods, investing in renewable energy sources, and improving energy efficiency across industries. Governments also promote green efficiency through sustainable urban planning, green building standards, and financial incentives. Although implementation may face barriers such as high upfront costs and technological limitations, with financial support and technological advancements including AI and IoT, green efficiency is poised to become a critical driver of sustainable economic growth (World Economic Forum, 2023).

2.3 Hypothesis

2.3.1 The relationship between energy efficiency and three pillars of ESG performance

First, energy efficiency is widely recognized as a critical driver of environmental performance, especially through its role in reducing greenhouse gas emissions and resource consumption (Porter & van der Linde, 1995). In the context of the European Union, Kwilinski et al. (2023) highlight the significant potential of digital

transformation and its spatial spillover effects in boosting green transitions. Similarly, Mneimneh et al. (2023) show how environmental criteria strongly influence green innovation in national policy and business strategy, particularly via energy efficiency and renewable energy investment. Hou et al. (2019) and Qamruzzaman (2022) further confirm that eco-innovation and green technology adoption contribute positively to environmental outcomes by minimizing energy waste. Based on this body of research, this study proposes the following:

H1: Energy efficiency enhances ESG performance through environmental performance.

Second, energy-efficient strategies are increasingly being used by firms to improve social outcomes and stakeholder relations. By cutting emissions and reducing waste, firms show a commitment to public and employee health, strengthening their social license to operate. Empirical research by Chen et al. (2022) in China's green finance reform program found that firms' ESG scores improved significantly, primarily due to enhanced social responsibility practices. Likewise, Baran et al. (2022) observed that Polish energy firms that optimized energy use achieved stronger ESG outcomes. Yoon et al. (2021) also linked energy efficiency to ethical corporate behavior, such as reduced tax avoidance, reinforcing firms' social legitimacy. Informed by these studies, the research presents the following hypothesis:

H2: Energy efficiency enhances ESG performance through social performance.

Third, corporate governance benefits from energy efficiency due to improved decision-making and transparency mechanisms. Barykin et al. (2022) noted that energy-focused digital solutions require structured governance frameworks. Ebrahimi and Koh (2021) suggest that integrating sustainability targets compels firms to formalize procedures and enhance monitoring. Sun (2024) and Wang & Sun (2022) further emphasize that robust governance can compensate for external regulatory pressures when firms commit to internal ESG goals. These insights point to a positive link between energy efficiency and governance quality, leading to the following hypothesis:

H3: Energy efficiency enhances ESG performance through governance performance.

2.3.2 The relationship between the Green tax and three pillars of ESG performance

Firstly, green taxation internalizes the environmental costs of corporate activities and incentivizes eco-friendly practices. Sun et al. (2024) discuss how environmental taxes directly support emissions reduction and green investments. Li & Li (2022) found that China's environmental protection tax led to green technology innovation and improved ESG ratings. Similarly, Shen and Zhang (2022) report that environmental tax policy significantly boosted industrial green productivity. These findings justify the following hypothesis:

H4: Green tax enhances ESG performance through environmental performance.

Secondly, green taxes not only benefit the environment but also strengthen firms' social responsibility. Yoon et al. (2021) show that firms complying with environmental taxes demonstrate higher ethical standards and are less likely to engage in tax avoidance. Mpofu (2022) notes that tax revenue from environmental levies can fund health and social welfare programs. He et al. (2023)

emphasize that stakeholder oversight amplifies these benefits, reinforcing social trust. In light of this, the study hypothesizes:

H5: Green tax enhances ESG performance through social performance.

Thirdly, green tax compliance requires firms to strengthen internal systems for transparency, reporting, and accountability. He et al. (2021) and Zheng et al. (2022) demonstrate that firms with better green tax practices also exhibit improved governance structures. Yoon et al. (2021) add that strong governance enhances the reliability and timeliness of environmental reporting, fostering investor and stakeholder confidence. These observations support the formulation of the following hypothesis:

H6: Green tax enhances ESG performance through governance performance.

Energy efficiency plays a role in influencing how firms respond to green tax policies. Norouzi et al. (2022) analyzed the interplay between green tax and energy efficiency in Iran and found that optimal tax levels led to significant environmental improvements. As taxes on pollutants rise, firms are motivated to invest in cleaner, energy-saving technologies to reduce tax burdens and align with environmental goals. Based on this mechanism, the study proposes:

H7: Energy efficiency positively influences green tax response.

2.3.3 Green tax as a mediator between energy efficiency and three pillars of ESG performance

The relationship between energy efficiency and environmental outcomes may be enhanced through green tax policy. Porter & van der Linde (1995) argue that environmental regulation can spur innovation. Lei et al. (2022) and Zhou et al. (2022) show that green taxes promote cleaner production, while Albrizio et al. (2017) found that firms adopting energy efficiency under tax incentives achieved better environmental results. These findings inform the next hypothesis:

H8: Green tax mediates the relationship between energy efficiency and environmental performance.

Green taxes can amplify the social benefits of energy efficiency by encouraging firms to reinvest cost savings into community and stakeholder-oriented initiatives. Baah et al. (2021) confirm that energy efficiency enhances stakeholder legitimacy, while Zhao et al. (2023) and He et al. (2021) show that green tax regimes can generate societal benefits and increase corporate transparency. Therefore, this study proposes:

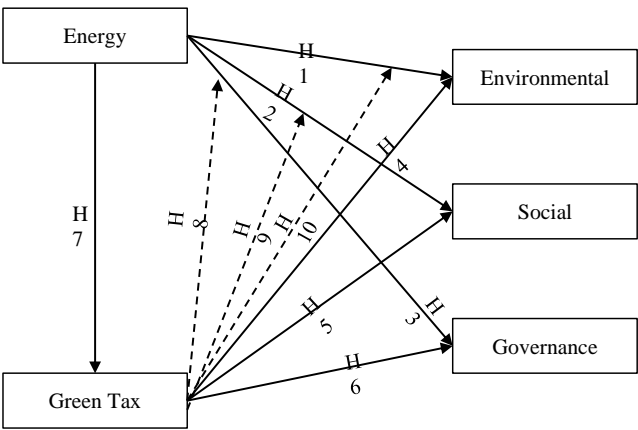
H9: Green tax mediates the relationship between energy efficiency and social performance.

Variables	Symbol	Items	Types	Measurement	Source
Energy efficiency	(EE)	4	Independent variable	Likert Scale	Porter & Linde (1995); Lei et al. (2022); Zhou et al. (2022)
Green Tax	(GT)	4	Mediating variable	Likert Scale	Sun et al. (2024); Li & Li (2022); He et al. (2023)
Environmental performance	(EP)	4	Dependent variable	Likert Scale	Kwilinski et al. (2023); Mneimneh et al. (2023); Hou et al. (2019)

Green tax requirements may compel firms to improve governance by embedding environmental objectives into oversight and decision-making systems. Eccles et al. (2014) and Delmas & Toffel (2008) demonstrate how regulatory pressure improves corporate disclosure. Wu & Furuoka (2020) emphasize that integrating environmental goals strengthens board accountability and risk management. Thus, the following hypothesis is proposed:

H10: Green tax mediates the relationship between energy efficiency and governance performance.

2.4 Research Model



3. METHODOLOGY AND DATA

3.1 Methodology

To achieve the research objectives, this study adopts a **deductive research approach**, developing theoretical hypotheses and testing them empirically. A **quantitative research strategy** is employed, using a structured **online survey** distributed to 157 managers and officers working in small and medium-sized construction enterprises in Vietnam. Respondents were selected through **random sampling** to ensure representativeness. Data collection was conducted over a specific period using a **cross-sectional design**, allowing for a snapshot analysis of current business practices. The survey instrument was based on established ESG and sustainability frameworks, with responses measured on a **5-point Likert scale**. Primary data analysis was performed using **Partial Least Squares Structural Equation Modeling (PLS-SEM)** to assess both the measurement model (reliability, validity) and the structural model (hypotheses testing). Key statistical indicators, including R-squared, path coefficients, and mediation effects, were analyzed to evaluate the relationships between energy efficiency, green tax, and ESG performance.

3.2 Variable

Social performance	(SP)	4	Dependent variable	Likert Scale	Chen et al. (2022); Baran et al. (2022); Yoon et al. (2021)
Governance performance	(GP)	2	Dependent variable	Likert Scale	Ebrahimi & Koh (2021); Wang & Sun (2022)

4. RESULT

4.1 PLS-SEM analysis

4.1.1 Descriptive statistics

Table 1: Demographic information of the sample

	N	%			N	%
Gender				Education degree		
Male	73	46.5		Bachelor degree	139	88.5
Female	84	53.5		Master	15	9.6
				PhD	3	1.9
Age				Position and role		
20 -27	23	14.6		Finance controller	44	28
28 - 35	67	42.7		Chief financial officer	28	17.8
36 - 45	54	34.4		Management accountant	12	7.6
Over 45	13	8.3		Departmental manager	9	5.7
				Senior officer	64	40.9

During the data collection process, the research focused on surveying key employees and managers holding important positions across 41 small and medium-sized enterprises (SMEs) operating in the construction sector in Vietnam. These respondents were selected because of their direct involvement in business decision-making and sustainability-related activities within their organizations. The total number of valid responses collected was 157. Although the sample size was slightly lower than the initially expected number, the quality of the responses was ensured by targeting individuals with relevant expertise and responsibilities in their companies.

4.1.2 Evaluation of measurement model

Table 2: Outer loading

	EE	EP	GP	GT	SP	GT x EE
EE1	0.858					
EE2	0.855					
EE3	0.728					
EE4	0.806					
EP1		0.755				

EP2		0.757				
EP3		0.759				
EP4		0.799				
GP1			0.866			
GP2			0.753			
GP3			0.901			
GT1				0.784		
GT2				0.793		
GT3				0.773		
GT4				0.791		
SP1					0.813	
SP2					0.825	
SP3					0.716	
SP4					0.865	
GT x EE						1.000

According to Table 1, the outer loadings for the constructs in the survey data indicate that all items meet the recommended threshold of 0.708 as per Hair et al. (2016), indicating good indicator reliability.

Table 3: Cronbach alpha, composite reliability and AVE

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
EE	0.828	0.828	0.886	0.662
EP	0.769	0.774	0.852	0.590
GP	0.794	0.820	0.879	0.710
GT	0.793	0.796	0.866	0.617
SP	0.821	0.832	0.881	0.651

In Table 2, the Cronbach alpha ranges from 0.769 (EP) to 0.828 (EE), indicating acceptable to good internal consistency across all constructs. The highest reliability is observed for Energy Efficiency (EE) at 0.828, suggesting strong coherence among items related to energy-efficient practices. Social Performance (SP) and Governance Performance (GP) also demonstrate good reliability with values of 0.821 and 0.794, respectively. However, EP has the lowest value of 0.769, which, although acceptable, may benefit from further refinement.

In this analysis, the composite reliability values range from 0.852 (EP) to 0.886 (EE), confirming that the constructs have high reliability and internal consistency. Notably, the highest composite reliability is found for Energy Efficiency (EE) at 0.886, suggesting a robust internal structure. All values are within the ideal range, further validating the constructs' consistency.

For the AVE, values range from 0.590 (EP) to 0.710 (GP), indicating that more than 50% of the variance is explained by the constructs. Governance Performance (GP) shows the highest AVE of 0.710, demonstrating its strong explanatory power over its indicators. Although EP has the lowest AVE at 0.590, it still meets the required level, confirming acceptable convergent validity. Overall, the measurement model demonstrates reliable constructs with satisfactory internal consistency and convergent validity.

Table 4: HTMT criterion

	EE	EP	GP	GT	SP	GT x EE
EE						
EP	0.943					
GP	0.764	0.708				
GT	0.921	1.010	0.646			
SP	0.840	0.893	0.844	0.898		
GT x EE	0.149	0.402	0.273	0.204	0.217	

Most constructs meet the HTMT threshold, confirming acceptable discriminant validity. However, EE - GT (0.921) and EP - GT (1.010) exceed the 0.90 limit, indicating poor differentiation. SP - GT (0.898) is borderline. This suggests overlap in how respondents perceive green tax, particularly its strong link with energy efficiency and environmental outcomes, which may affect the clarity of their distinct effects in the model.

4.1.3 Evaluation of Structural model

Table 5: VIF

	VIF		VIF		VIF		VIF		VIF
EE1	2.308	EP1	1.513	GP1	2.162	GT1	1.898	SP1	2.134
EE2	2.794	EP2	1.567	GP2	1.373	GT2	1.838	SP2	2.349
EE3	1.442	EP3	1.502	GP3	2.203	GT3	1.848	SP3	1.845
EE4	2.044	EP4	1.599	GT x EE	1.000	GT4	1.911	SP4	2.594

According to Table 4, all VIF values are below the acceptable threshold of 4.0, indicating no significant multicollinearity issues.

Table 6: R-square (R^2)

	R-square	R-square adjusted
EP	0.743	0.728
GP	0.435	0.402
SP	0.594	0.570

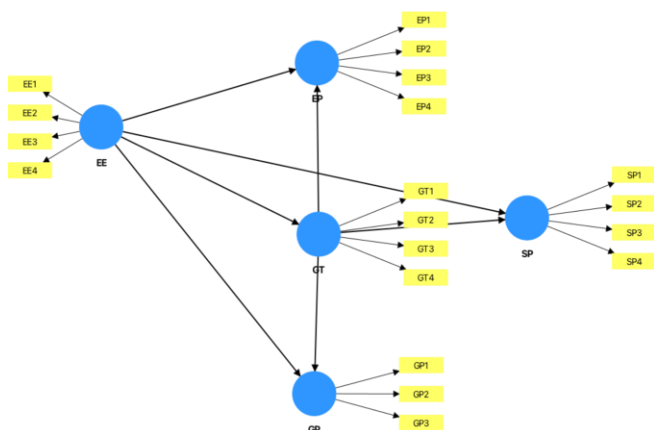
The R^2 values indicate moderate explanatory power for Environmental Performance (0.743) and Social Performance (0.594), while Governance Performance shows a weaker R^2 of 0.435. These results suggest the model predicts EP and SP reasonably well but has limited explanatory power for GP. Adjusted R^2 values are slightly lower, as expected, due to model complexity.

Table 7: Path coefficients

Model 1						Model 2					
	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values		Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
EE -> EP	0.374	0.375	0.143	2.620	0.009	EE -> EP	0.400	0.403	0.138	2.899	0.004
EE -> GP	0.555	0.556	0.138	4.026	0.000	EE -> GP	0.577	0.583	0.131	4.422	0.000
EE -> SP	0.356	0.364	0.119	2.985	0.003	EE -> SP	0.363	0.371	0.117	3.093	0.002
GT -> EP	0.516	0.521	0.132	3.911	0.000	GT -> EP	0.455	0.459	0.127	3.585	0.000
GT -> GP	0.100	0.108	0.127	0.790	0.430	GT -> GP	0.050	0.049	0.136	0.368	0.713
GT -> SP	0.465	0.464	0.129	3.605	0.000	GT -> SP	0.448	0.447	0.135	3.306	0.001
EE -> GT	0.749	0.755	0.057	13.234	0.000						
MOD1	-	-	-	-	-	MOD1	0.238	0.232	0.059	4.057	0.000
MOD2	-	-	-	-	-	MOD2	0.194	0.198	0.110	1.765	0.078
MOD3	-	-	-	-	-	MOD3	0.068	0.061	0.093	0.730	0.465

Note: MOD1 MOD2, MOD 3 represent GTxEE→EP, GTxEE→GP, GTxEE→SP respectively

Figure 2: PLS SEM Model estimation on model 1



The path coefficient analysis for Model 1 examines the direct relationships between Energy Efficiency (EE), Green Tax (GT), and the three dimensions of ESG performance: Environmental

Performance (EP), Social Performance (SP), and Governance Performance (GP). The analysis also tests the proposed hypotheses (H1 to H7) to determine the influence of EE and GT on various aspects of ESG performance.

4.2 Energy Efficiency and ESG Performance

First, the findings indicate that Energy Efficiency positively affects Environmental Performance, with a path coefficient of 0.374 (H1). Since the p-value is below the 0.05 threshold, this result is statistically significant, suggesting that organizations adopting energy-efficient practices effectively improve their environmental management through actions such as reducing carbon emissions, optimizing resource usage, and implementing cleaner production technologies. This finding aligns with the study by Hou et al. (2019), which evaluated energy efficiency and environmental performance across various regions. Additionally, Qamruzzaman (2022) demonstrated the role of energy efficiency in supporting environmental quality management.

Second, Energy Efficiency also positively influences Social Performance (H2), as indicated by a path coefficient of 0.356 and a p-value of 0.003. This statistically significant relationship indicates that organizations implementing energy-efficient practices tend to enhance their social responsibility. The findings are consistent with

the work of Olatunde et al. (2024) and Phan et al. (2020), which reviewed the impact of energy-efficient appliances on enhancing social welfare by improving household consumption patterns and energy usage.

Third, the analysis also reveals that Energy Efficiency significantly improves Governance Performance (H3), with a path coefficient of 0.555. This finding suggests that energy-efficient companies are likely to establish better governance structures characterized by transparency, accountability, and ethical standards. Studies by Qamruzzaman (2022), Kwilinski et al., (2023) and Ng et al., (2022) highlighted that energy efficiency contributes to improved institutional quality and governance mechanisms through adherence to environmental regulations and quality management systems.

4.3 Green tax and ESG performance

The analysis indicates that Green Tax has a strong positive effect on Environmental Performance, as demonstrated by a path coefficient of 0.516 and a p-value of 0 (H4), suggests a moderately high impact, meaning that an increase in green tax policies is associated with a significant improvement in corporate environmental performance. This result was also found in the studies of Li.J and Li.S (2022) Zhang et al., (2023), emphasizing the strong impact of environmental taxes in catalyzing environmentally friendly changes in enterprises. Thus, green taxation can be an effective strategy for policymakers to enhance corporate sustainability and environmental performance.

Green Tax also positively influences Social Performance, as indicated by a path coefficient of 0.465 ($p = 0.000$) (H5). The statistical significance of this relationship suggests that companies complying with green tax regulations enhance their social initiatives, such as improving employee welfare and community engagement. Similar findings have been reported by Lin et al. (2022) and Zhang et al. (2023), demonstrating that green tax compliance can enhance social welfare. In addition, the study by Yoon et al., (2021) also showed similar results, demonstrating that corporate compliance with green tax principles enhances synergistic relationships with stakeholders, amplifying social performance.

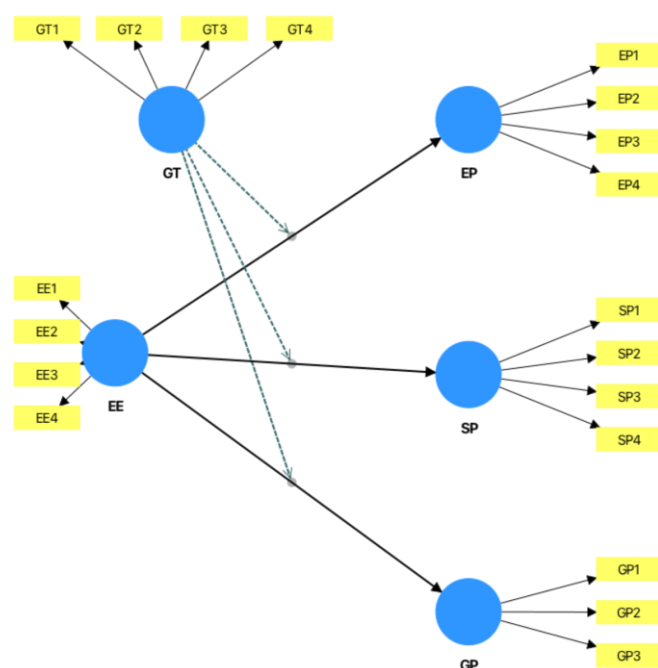
The analysis shows that Green Tax has no significant impact on Governance Performance, as indicated by a path coefficient of 0.100 and a p-value of 0.430 (H6), suggesting only a weak association between green tax policies and governance performance confirming that this relationship is statistically insignificant. This means that any observed effect is likely due to random variation rather than a true causal relationship. This result is in contrast to the studies of Sun et al., (2024), He et al., (2021) and Zheng et al., (2022) where the authors emphasized the link between financial compliance with green tax obligations and sound governance structures, demonstrating the protocol of strict governance, transparency, accountability and ethical behavior. This finding suggests that green tax policies, which primarily target environmental improvements, may not directly influence corporate governance structures. Several possible explanations exist for this outcome. First, regulatory enforcement mechanisms may be weak, making it difficult to ensure that companies integrate governance improvements alongside environmental policies. Second, existing green tax incentives may not be designed to encourage better governance practices, focusing instead on operational or environmental compliance rather than corporate leadership, transparency, and accountability. As a result, companies may

respond to green tax policies by adjusting their environmental strategies without necessarily improving governance structures. Addressing these challenges may require policymakers to align environmental taxation with corporate governance incentives, ensuring that sustainability efforts extend beyond operational compliance to broader governance improvements.

Additionally, the analysis shows that Energy Efficiency positively influences Green Tax compliance, with a path coefficient of 0.749 and a p-value of 0 (H7). This significant relationship suggests that organizations adopting energy-efficient practices are more likely to comply with green tax regulations. Studies by Porter and Van der Linde (1995) and Yuan et al. (2023) emphasize that energy-efficient firms are better positioned to benefit from fiscal incentives and regulatory requirements aimed at promoting sustainability. The results also show that proactive steps towards energy efficiency not only signal operational and cost efficiencies for companies but also provide financial benefits in the form of green tax credits.

4.4 Mediating effect of green tax in the relationship between energy efficiency and three pillars of ESG performance

Figure 3: PLS SEM Model estimation on model 2



Model 2 examines the moderating role of the interaction on the relationships between Green Tax (GT) and the three dimensions of ESG performance: Environmental Performance (EP), Social Performance (SP), and Governance Performance (GP). The analysis provides insights into whether the interaction between GT and EE strengthens or weakens these relationships.

The results reveal that the interaction term $GT \times EE$ significantly influences Environmental Performance (p value equal 0), with a path coefficient of 0.238 (H8). This finding suggests that when Green Tax policies are applied in conjunction with Energy Efficiency practices, their combined effect significantly enhances Environmental Performance. However, when comparing this finding with other studies, such as Zheng et al. (2022) and Zhang et al. (2023), which reported a mediating effect of green tax between

energy efficiency and environmental performance (rather than an interaction effect), a notable difference emerges in how the mechanisms are conceptualized. While these studies argue that energy efficiency does not directly improve environmental outcomes but operates through green tax mechanisms as a mediator, the present study identifies a direct interaction effect between green tax compliance and energy efficiency efforts, without positioning green tax as a mediator. The difference between this study and previous research, which reported green tax as a mediator between energy efficiency and environmental performance, may be explained by the specific context of Vietnam's construction industry. In this sector, environmental tax policies are still in an early stage of development, with limited enforcement and weak integration between fiscal incentives and environmental management systems. Most construction companies, particularly SMEs, prioritize direct energy-saving practices at the project level rather than strategically leveraging green tax benefits as the main pathway to environmental outcomes. Unlike manufacturing industries with stable production cycles and systematic tax planning, construction projects often focus on short-term compliance and cost control. Therefore, in this research, green tax works more as an interacting factor that strengthens the effect of energy efficiency, rather than acting as a separate mediating mechanism as found in other sectors and contexts.

However, the interaction does not significantly influence Governance Performance (H9), with a path coefficient of 0.194 and a p-value of 0.078. Although this effect is positive, it remains statistically insignificant, suggesting that the combination of Green Tax and Energy Efficiency may not substantially improve governance structures. This finding contrasts with the expectation that aligning energy efficiency practices with tax incentives would enhance governance mechanisms as Li and Li (2022), Zhang et al., (2023). For this reason, in Vietnam's construction sector, green tax policies are primarily designed to encourage environmental compliance rather than directly link to social investment or governance improvements. Many construction companies, especially SMEs, focus on short-term project execution and cost control, with limited strategic planning to reinvest tax benefits into social programs or governance reforms. Unlike larger corporations in other industries where fiscal savings from energy efficiency may be redirected toward CSR activities or governance enhancements, Vietnamese construction firms often lack structured mechanisms or regulatory pressure to make such linkages. Furthermore, the weak enforcement of ESG reporting and the absence of mandatory corporate governance standards reduce the likelihood that energy-saving measures combined with tax incentives will translate into better governance outcomes. As a result, while environmental impacts are amplified through the interaction of green tax and energy efficiency, their influence on governance structures remains limited in this setting.

Similarly, the interaction term GT x EE shows no significant effect on Social Performance, with a path coefficient of 0.068 and a p-value of 0.465 (H10). The high p-value indicates that the combined effect of Green Tax and Energy Efficiency practices does not directly enhance social performance. It is possible that while energy-efficient practices and green tax compliance contribute independently to social performance, their interaction may not produce additional benefits. This finding is consistent with studies suggesting that social performance improvement requires more direct initiatives focused on community engagement and corporate social responsibility (CSR) practices rather than solely relying on

energy efficiency or fiscal policies (Phan et al., 2020). Moreover, Liu and Lyu (2022), Rehman and Wang (2021) offer a contradictory result. This may be explained by the business priorities and structural characteristics of Vietnam's construction industry. In this sector, tax incentives related to energy efficiency are typically used to support project-level environmental compliance or cost-saving measures, rather than being strategically redirected toward social initiatives or governance enhancements. Unlike larger corporations in manufacturing or energy sectors, where fiscal savings are often reinvested into CSR activities or governance improvements, many Vietnamese construction SMEs operate with limited budgets and short-term project focus, reducing the likelihood of allocating financial gains toward social programs or ethical leadership development. Additionally, the lack of strong ESG reporting requirements and stakeholder pressure on social responsibility in the construction field may further weaken the connection between green tax benefits and improvements in social or governance dimensions. Therefore, while both energy efficiency and green tax may independently contribute to certain ESG outcomes, their interaction does not produce significant synergies in social or governance performance within this specific industrial context.

5. RECOMMENDATION

The research findings highlight key relationships between Energy Efficiency, Green Tax compliance, and ESG performance in the Vietnamese construction sector. These results provide practical recommendations for construction companies aiming to improve their sustainability performance through a combination of operational and financial strategies.

First, the study confirms that Energy Efficiency has a significant positive impact on Green Tax compliance. This suggests that companies investing in energy-saving technologies and efficient construction processes are more likely to meet environmental tax requirements and benefit from fiscal incentives. Therefore, construction firms should actively integrate energy efficiency initiatives into their business operations, such as adopting high-performance insulation materials, smart energy monitoring systems, and renewable energy solutions like solar panels for construction sites. These actions not only reduce energy costs but also improve the company's ability to comply with green tax policies, which are increasingly tied to the use of environmentally friendly technologies.

Second, the results demonstrate that the interaction between Green Tax and Energy Efficiency significantly enhances Environmental Performance. This indicates that the environmental benefits of energy efficiency measures are amplified when combined with compliance to green tax regulations. Companies are therefore recommended to design sustainability plans that coordinate both strategies together. For example, a construction firm might prioritize the use of recycled aggregates and low-carbon cement while also installing on-site renewable energy systems. When these actions are supported by green tax incentives, the firm can achieve greater reductions in carbon emissions and resource consumption. This integrated approach allows companies not only to meet ESG standards but also to access green financing and carbon credit opportunities, which can further support their long-term sustainability goals.

Third, these findings suggest that financial tools such as green tax policies should not be viewed in isolation but should be actively

connected with operational energy efficiency measures. Construction companies should establish internal teams responsible for monitoring both energy efficiency progress and tax compliance performance. By aligning these two aspects, firms can better respond to regulatory requirements, improve their environmental outcomes, and position themselves competitively in the growing green construction market. In particular, companies aiming to participate in large infrastructure projects funded by international organizations (such as the World Bank or ADB) can strengthen their bids by demonstrating integrated strategies that combine operational efficiency with fiscal responsibility.

Finally, the positive relationship between energy efficiency and green tax compliance reinforces the idea that financial and operational strategies can work together to support sustainable business growth. Companies that recognize this synergy will not only benefit from cost savings and regulatory compliance but will also enhance their environmental leadership and social responsibility. These strategies help construction firms in Vietnam contribute effectively to national green growth goals and international climate commitments.

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Due to certain objective limitations in terms of time and scope, shortcomings and imperfections in this study are inevitable. Therefore, we respectfully welcome any comments, feedback, and constructive suggestions from esteemed faculty members and readers interested in this topic, in order to improve and refine our work.

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DECLARATION OF ORIGINALITY

We, the undersigned authors, hereby declare that the research paper entitled "Enhancing ESG Performance in Vietnam's Construction Industry: The Role of Energy Efficiency and Green Tax Policies" is the result of our group's independent work, carried out under the academic supervision of Lecturer Nguyen Thi Cam Giang. The study reflects our collective intellectual efforts and has been conducted with integrity, in full compliance with academic and ethical standards. All data, materials, and sources used in this research have been accurately cited and transparently documented. The analysis was carried out rigorously and objectively. We affirm

that this paper contains no plagiarism, data manipulation, or academic misconduct, and we accept full responsibility for its content and conclusions.

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