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Sustainable Environmental Management Practices in Ghanaian SMEs: The Roles of Environmental Awareness, Corporate Governance and Regulatory Pressure

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Abstract
Small and medium-sized enterprises (SMEs) dominate Ghana's private sector, yet their combined environmental footprint is poorly managed and seldom measured. This study examines how environmental awareness, corporate governance and regulatory pressure shape the adoption of sustainable environmental management practices (SEMP) among Ghanaian SMEs, and whether regulatory pressure conditions the effects of the two internal drivers. Grounded in the natural resource-based view and institutional theory, the study uses survey data from 450 owner-managers and senior executives of SMEs in the Greater Accra, Ashanti, Western and Northern regions, analysed with partial least squares structural equation modelling (PLS-SEM). Corporate governance ($\beta = 0.327$, $p < .001$) and regulatory pressure ($\beta = 0.384$, $p < .001$) have strong positive effects on SEMP, whereas the effect of environmental awareness is positive but weak and significant only at the 10% level ($\beta = 0.142$, $p = .065$). Regulatory pressure strengthens the link between awareness and SEMP ($\beta = 0.168$, $p = .004$) but weakens the link between governance and SEMP ($\beta = -0.124$, $p = .027$). The model explains 48.7% of the variance in SEMP. The results indicate that awareness turns into practice mainly where enforcement is credible, and that regulation and internal governance behave as substitutes rather than complements when governance structures have not been designed with environmental responsibilities in mind. The importance-performance map identifies corporate governance as the area with the greatest room for improvement. The study offers an integrated account of internal and institutional drivers of SME environmental practice in a weakly enforced regulatory setting and draws out implications for regulators, SME boards and the emerging sustainability accounting agenda in Ghana.

Keywords: *sustainable environmental management practices; environmental awareness; corporate governance; regulatory pressure; sustainability accounting; SMEs; Ghana; PLS-SEM*

1. Introduction

Small and medium-sized enterprises (SMEs) form the backbone of Ghana's private sector. They make up the overwhelming majority of business establishments and account for a large share of non-farm employment and output (Ghana Statistical Service [GSS], 2024; Padi & Musah, 2022). This economic weight carries an environmental cost that is easy to overlook because it is dispersed. Taken one at a time, the emissions, effluent and solid waste of a single small firm look trivial; taken together, the sector is a material source of pollution, resource depletion and waste in urban and peri-urban Ghana (Anaman et al., 2023; Efobi et al., 2019). Many firms run ageing, energy-intensive equipment, rely on informal waste disposal and keep little or no record of their environmental performance. Their environmental transition is therefore both pressing and difficult.

Sustainable environmental management practices (SEMP) are the organisational routines through which a firm reduces its environmental impact while remaining economically viable. They include waste reduction, energy and water efficiency, the use of less harmful materials, protection of local ecosystems, staff training and environmental reporting (Adenutsi et al., 2025; Ahinful & Tauringana, 2019). For SMEs, SEMP has become a commercial question as much as an ethical one. Evidence from both developed and developing economies links environmental practices to lower input costs, stronger stakeholder legitimacy, better access to finance and green innovation (D. J. Boakye et al., 2020; Das, 2024;

Dzomonda, 2022; Gomes et al., 2024). Buyers in export value chains increasingly ask suppliers for evidence of environmental compliance, and lenders are beginning to screen borrowers for environmental risk. Even so, adoption among Ghanaian SMEs remains thin and uneven, held back by limited finance, weak enforcement and the daily pressure of survival (Anaman et al., 2023; Durrani et al., 2024).

Research on the environmental behaviour of Ghanaian SMEs has concentrated on two questions: what prevents adoption, and whether adoption pays. Studies have documented the financial returns to environmental management practices (Ahinful & Tauringana, 2019), the contribution of waste and biodiversity management to financial performance and the amplifying role of board effectiveness (Adenutsi et al., 2025), the implementation of environmental practices in mining and manufacturing supply chains (Famiyeh & Kwarteng, 2018), and the role of environmental orientation and relational capital in firm performance (Baah et al., 2022). Far less is known about the antecedents of adoption itself, and in particular about how cognitive, organisational and institutional drivers operate together. Three gaps follow from this.

First, there is little evidence on the joint influence of the main internal and external antecedents of SEMP. Environmental awareness is the cognitive starting point for environmental action: it reflects how well owner-managers understand environmental issues and their consequences for the business. Corporate governance is the structural mechanism through which environmental considerations enter organisational decisions. Regulatory pressure is the external institutional force that sets compliance expectations and determines how seriously they are enforced. These factors sit at different levels (individual cognition, organisational structure and the institutional environment), yet most studies examine them one at a time (Madrid-Guijarro & Duréndez, 2024; Paiva et al., 2024; Tyler et al., 2024).

Second, the contingent character of these relationships has received limited attention. Regulatory pressure may do more than push firms directly towards SEMP; it may also determine whether internal drivers work at all. Where enforcement is consistent, owner-managers who understand environmental risk have a reason to act on that understanding, and boards that intend to promote sustainability have external backing for doing so. Where enforcement is weak, formal structures and actual practice can drift apart, a pattern institutional theorists describe as decoupling (Meyer & Rowan, 1977). Knowing which of these patterns prevails matters for the design of policy.

Third, Ghana offers an institutional setting that limits the transfer of findings from developed economies. Environmental regulation has historically been under-resourced and unevenly enforced (Efobi et al., 2019; Li et al., 2021), the legal framework was overhauled in 2025 with the passage of the Environmental Protection Act, 2025 (Act 1124), and no binding sustainability reporting regime applies to SMEs. Informal institutions, including community norms, family ties and traditional authority, also shape what firms consider acceptable conduct (Baah et al., 2022). The drivers of SEMP in such a setting are unlikely to mirror those found where formal regulation is strong and predictable.

This study addresses these gaps by examining the effects of environmental awareness, corporate governance and regulatory pressure on SEMP among Ghanaian SMEs and by testing whether regulatory pressure moderates the effects of the two internal drivers. Drawing on the natural resource-based view (NRBV) and institutional theory, it estimates an integrated model with partial least squares structural equation modelling (PLS-SEM) on data from 450 SMEs. The study makes three contributions. It shows that all three antecedents are positively associated with SEMP but that their weights differ markedly, with awareness the weakest. It shows that regulatory pressure strengthens the awareness–SEMP relationship but weakens the governance–SEMP relationship, which points to a substitution between external enforcement and internal governance. Finally, it translates these results into guidance for regulators, SME boards, finance providers and the accountancy profession on aligning governance arrangements with regulatory expectations.

The rest of the paper is organised as follows. Section 2 reviews the literature, sets out the theoretical framework and develops the hypotheses. Section 3 describes the methodology. Section 4 reports the results. Section 5 discusses the findings and their theoretical, practical and policy implications, and Section 6 concludes.

2. Literature Review, Theoretical Framework and Hypotheses

2.1 Sustainable Environmental Management Practices in SMEs

Environmental management in SMEs differs from that in large firms in ways that matter for theory and policy. SMEs seldom have dedicated environmental staff, certified management systems or sustainability reports. Their environmental practices tend to be informal, owner-driven and closely tied to cost control (Ahinful & Tauringana, 2019; Anisah et al., 2024). Decisions are concentrated in the hands of the owner-manager, so personal values and knowledge carry unusual weight (Mitra, 2024). At the same time, SMEs are more exposed to resource constraints and are less able to absorb the fixed costs of compliance (Durrani et al., 2024; Seroka-Stolka & Fijorek, 2020).

Studies of SMEs across Europe, Asia and Africa point to a common set of barriers: shortage of finance, limited technical knowledge, the perception that environmental investment does not pay, and weak or inconsistent external pressure (Anaman et al., 2023; Durrani et al., 2024; Madrid-Guijarro & Duréndez, 2024). The same literature identifies a set of enablers. Management commitment mediates the effect of external pressures on environmental practice (Madrid-Guijarro & Duréndez, 2024), a proactive orientation interacts with regulatory pressure in shaping adoption (Tyler et al., 2024), and stakeholder pressure combined with firm size predicts proactive environmental strategy (Seroka-Stolka & Fijorek, 2020). External pressure has also been shown to improve both environmental outcomes and manufacturing performance when matched by internal management practices (Adebanjo et al., 2016).

In Ghana, the evidence base is growing but remains fragmented. Ahinful and Tauringana (2019) found that environmental management practices are associated with better financial performance among SMEs, and Adenutsi et al. (2025) showed that board effectiveness strengthens the link between SEMP and financial performance. Famiyeh and Kwarteng (2018) documented the implementation of environmental practices in mining and manufacturing supply chains, while Baah et al. (2022) showed that environmental orientation and relational capital improve SME performance, with cultural and mimetic orientations playing a part. Behavioural research on waste disposal in Ghana shows that knowing what is right does not always produce the corresponding behaviour (M. K. Boakye et al., 2024). Recent work has also linked environmental awareness to green investment readiness among Ghanaian SMEs (Padi et al., 2026). What is missing is a model that places the cognitive, governance and regulatory drivers side by side and tests how they interact.

2.2 Natural Resource-Based View

The NRBV extends the resource-based view by arguing that firms can build sustained competitive advantage from capabilities that reduce environmental harm while creating economic value (Hart, 1995). Hart identified three such strategic capabilities: pollution prevention, product stewardship and sustainable development. They are hard to imitate because they depend on tacit knowledge, organisational commitment and coordination across functions that competitors cannot easily replicate.

SEMP can be read as an NRBV capability. By lowering energy and material inputs, cutting waste and improving process discipline, SEMP can yield cost advantages; by giving products and processes credible environmental attributes, it can support differentiation; and by demonstrating responsible conduct, it can secure legitimacy with customers, communities and regulators (D. J. Boakye et al., 2020; Gomes et al., 2024). In Ghana, where resource inefficiency is a common constraint on SME productivity, the efficiency gains from SEMP may be especially large.

The NRBV also implies that knowledge does not turn into capability on its own. Awareness creates the potential for action, but converting it into routines requires complementary resources: governance arrangements that put environmental issues on the agenda, procedures for allocating resources to them and processes for monitoring results. This argument motivates the examination of both direct and interactive effects in the present study.

2.3 Institutional Theory

Institutional theory holds that organisations conform to the regulative, normative and cultural-cognitive structures of their environment in order to gain legitimacy and survive (DiMaggio & Powell, 1983; Scott, 2014). In the environmental domain, regulation is the clearest coercive force: it defines what firms must do and attaches consequences to failure. Its effect, however, depends on the credibility and consistency of enforcement. Where rules exist on paper but are rarely enforced, firms may adopt the form of

compliance without the substance, so that formal structures become decoupled from actual practice (Meyer & Rowan, 1977).

Ghana illustrates this tension. For three decades the Environmental Protection Agency Act, 1994 (Act 490) provided the principal legal basis for environmental regulation, supported by permit requirements and sector regulations. Enforcement capacity was limited, penalties were often too small to deter, and small firms were rarely inspected (Efobi et al., 2019; Li et al., 2021). In 2025 Parliament replaced Act 490 with the Environmental Protection Act, 2025 (Act 1124), which consolidates environmental legislation and strengthens the regulator's powers. At the time of this study the new regime was still being put into operation. SMEs therefore faced regulatory pressure that was real but uneven and, for many, uncertain in its practical demands.

In such a setting, the interplay between regulatory pressure and internal organisational factors becomes important. Regulatory pressure may act as a prompt that pushes firms to activate their governance mechanisms and act on what they know. It may also cut across those mechanisms. If regulatory demands do not match the way an SME is governed, or if compliance is handled outside the board, external pressure can displace internal deliberation instead of reinforcing it.

2.4 Hypotheses Development

2.4.1 Environmental awareness and SEMP

Environmental awareness refers to the extent to which owner-managers understand environmental issues, recognise the impacts of their operations and appreciate the business case for environmental management (Paiva et al., 2024). Awareness is a precondition for deliberate action: firms do not implement practices whose purpose they do not understand. Among Angolan SMEs, environmental awareness was found to support the diffusion of corporate social responsibility practices (Paiva et al., 2024), and among Ghanaian SMEs it has been associated with readiness to invest in renewable energy, with Padi et al. (2026) reporting a path coefficient of 0.519 ($p < .001$) for its effect on green investment readiness. Awareness alone may nonetheless fall short where resources are scarce and external pressure is weak, as behavioural evidence from Ghana suggests (M. K. Boakye et al., 2024). The study therefore proposes:

H1: Environmental awareness has a positive effect on SEMP among Ghanaian SMEs.

2.4.2 Corporate governance and SEMP

Corporate governance covers board composition, decision-making structures, accountability mechanisms and stakeholder engagement. It provides the organisational infrastructure through which environmental considerations reach strategy and operations. Effective governance ensures that environmental objectives receive attention, that resources are allocated to them and that performance is monitored and reported (Coffie et al., 2018; Dzomonda, 2022). In Ghanaian SMEs governance ranges from formal boards with independent members to informal advisory arrangements rooted in family and community relationships (Padi & Musah, 2022). Governance quality has been linked to stronger financial performance (Padi & Musah, 2022; Padi et al., 2025), to more effective internal control (Musah et al., 2022) and to a stronger link between environmental practices and financial outcomes (Adenutsi et al., 2025). The study therefore proposes:

H2: Corporate governance has a positive effect on SEMP among Ghanaian SMEs.

2.4.3 Regulatory pressure and SEMP

Regulatory pressure captures the extent to which firms perceive that environmental rules are enforced, that non-compliance attracts meaningful penalties and that the regulator monitors their performance. Firms that perceive such pressure have a direct incentive to invest in SEMP to avoid sanctions and protect their legitimacy (DiMaggio & Powell, 1983). Empirical studies confirm that regulatory and other external pressures drive environmental practice in SMEs (Adebanjo et al., 2016; Madrid-Guijarro & Duréndez, 2024; Tyler et al., 2024). In Ghana, where enforcement has been inconsistent across sectors and regions, variation in perceived pressure is likely to explain a good deal of the variation in adoption (Efobi et al., 2019). Hence:

H3: Regulatory pressure has a positive effect on SEMP among Ghanaian SMEs.

2.4.4 The moderating role of regulatory pressure

The effect of awareness on SEMP is likely to depend on the strength of regulatory pressure. When pressure is high, owner-managers who understand environmental risks face clear reasons to act: the costs of non-

compliance are visible and the case for proactive management is easier to make. When pressure is low, even well-informed managers may find it hard to justify spending on practices that have no obvious compliance driver. Tyler et al. (2024) show that regulatory pressure interacts with firm-level orientation in shaping environmental practice adoption, which supports this reasoning.

A similar argument applies to governance. Strong regulatory pressure may lend authority to board members and managers who press for environmental priorities, allowing governance structures to deliver on their sustainability intent. Weak pressure may leave those structures without external support, so that short-term commercial concerns dominate. The study therefore proposes:

H4: Regulatory pressure positively moderates the relationship between environmental awareness and SEMP.

H5: Regulatory pressure positively moderates the relationship between corporate governance and SEMP.

3. Methodology

3.1 Research Design, Population and Sampling

The study adopted a quantitative, cross-sectional survey design. The target population comprised SMEs operating in Ghana in manufacturing, agro-processing, services and retail. In line with national classifications, SMEs were defined as enterprises employing fewer than 100 people and were grouped as micro (fewer than 6 employees), small (6–30 employees) and medium (31–99 employees) (GSS, 2024). Stratified random sampling was used to secure representation across these size bands and across four regions with contrasting economic structures: Greater Accra, Ashanti, Western and Northern.

Sample size was determined with reference to the requirements of PLS-SEM. An a priori power analysis in G*Power (Faul et al., 2009) for a model with five predictors of SEMP (three main effects and two interaction terms), a medium effect size ($f^2 = 0.15$) and a 5% significance level indicated a minimum of 92 cases for 80% power and 138 cases for 95% power. The target sample was set well above these figures to allow robust estimation of the interaction terms. Of 622 questionnaires distributed, 450 usable responses were obtained from owner-managers or senior executives with direct knowledge of their firm's environmental practices and governance, a response rate of 72.3%. The sample comfortably exceeds both the ten-times rule and the inverse square root method for PLS-SEM (Hair et al., 2022; Kock & Hadaya, 2018).

3.2 Measurement

All constructs were measured with multi-item scales drawn from prior studies and adapted to the Ghanaian SME setting. Items were rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree), consistent with earlier SEMP research in Ghana (Adenutsi et al., 2025; Ahinful & Tauringana, 2019). The instrument was reviewed by three academics in accounting and environmental management and pre-tested with a small group of owner-managers to check wording and relevance before full deployment. Table 1 summarises the constructs, and the full items are reported in Appendix A.

Table 1. Operationalisation of Constructs

Construct	Items	Domain covered	Principal sources
Environmental awareness (EA)	5	Understanding of environmental issues, recognition of operational impacts, appreciation of the business case	Paiva et al. (2024); Padi et al. (2026)
Corporate governance (CG)	6	Decision-making structures, board attention, accountability, stakeholder engagement, assignment of responsibilities	Padi & Musah (2022); Musah et al. (2022)
Regulatory pressure (RP)	5	Enforcement, penalties, monitoring, pressure from regulators, perceived necessity of compliance	Adebanjo et al. (2016); Tyler et al. (2024)

Construct	Items	Domain covered	Principal sources
Sustainable environmental management practices (SEMP)	8	Waste reduction, energy efficiency, water conservation, biodiversity protection, reporting, materials, policies, training	Ahinful & Tauringana (2019); Adenutsi et al. (2025)

Note. All items were measured on a five-point Likert scale (1 = strongly disagree; 5 = strongly agree).

3.3 Data Collection and Ethical Considerations

Data were collected between January and April 2025 through a structured questionnaire administered both online and in person. Ethical approval was granted by the Ethics Review Committee of Takoradi Technical University (approval number TTU/ERC/25/054). Participation was voluntary. Respondents received an information sheet explaining the purpose of the study, gave informed consent before taking part and were told that they could withdraw at any stage without consequence. No personal identifiers were recorded, responses were reported only in aggregate, and the data were stored on password-protected devices accessible only to the research team.

3.4 Common Method Bias

Because predictor and outcome variables came from the same respondents, procedural and statistical remedies were applied (Podsakoff et al., 2003). Procedurally, respondents were assured of anonymity, item order was randomised, and for a subsample of 150 respondents the predictor and outcome measures were collected two weeks apart. Statistically, Harman's single-factor test showed that the first factor accounted for 34.2% of the variance, below the 50% threshold. A full collinearity assessment returned variance inflation factors below 3.3 for all constructs (Kock, 2015). Common method bias is therefore unlikely to account for the results.

3.5 Analytical Strategy

The model was estimated in SmartPLS 4 (Ringle et al., 2022). PLS-SEM was chosen because the study is prediction-oriented, includes interaction terms and seeks to explain variance in a key outcome (Hair et al., 2022). The analysis followed the two-step procedure recommended by Hair et al. (2022). The measurement model was assessed for indicator reliability, internal consistency, convergent validity and discriminant validity. The structural model was then assessed through path coefficients, the coefficient of determination (R^2), predictive relevance (Q^2) and model fit (SRMR). Moderation was tested with the product-indicator approach, and significance was established by bootstrapping with 5,000 subsamples. Significant interactions were probed with simple slope analysis at one standard deviation above and below the mean of the moderator (Aiken & West, 1991). Finally, an importance-performance map analysis (IPMA) was run to identify priorities for managerial action (Ringle & Sarstedt, 2016).

4. Results

4.1 Measurement Model

Table 2 reports the measurement model. All indicator loadings exceeded 0.70, confirming indicator reliability. Cronbach's alpha ranged from 0.842 to 0.903 and composite reliability from 0.887 to 0.918, all above the 0.70 benchmark. Average variance extracted (AVE) ranged from 0.612 to 0.658, above the 0.50 threshold for convergent validity (Hair et al., 2022). Discriminant validity was supported by the Fornell–Larcker criterion (Fornell & Larcker, 1981) and by heterotrait–monotrait (HTMT) ratios, all of which were below 0.85 (Henseler et al., 2015).

Table 2. Reliability and Convergent Validity

Construct	Items	Loading range	Cronbach's α	CR	AVE
Environmental awareness (EA)	5	0.748–0.842	0.856	0.897	0.636
Corporate governance (CG)	6	0.762–0.871	0.878	0.910	0.628
Regulatory pressure (RP)	5	0.734–0.829	0.842	0.887	0.612

Construct	Items	Loading range	Cronbach's α	CR	AVE
SEMP	8	0.771–0.863	0.903	0.918	0.658

Note. CR = composite reliability; AVE = average variance extracted; SEMP = sustainable environmental management practices. Thresholds: loadings ≥ 0.70; α and CR ≥ 0.70; AVE ≥ 0.50.

4.2 Structural Model: Explanatory and Predictive Power

Before testing the hypotheses, the structural model was checked for explanatory power, predictive relevance and fit (Table 3). The model explains 48.7% of the variance in SEMP (R^2 = 0.487), which is moderate by the standards of behavioural research. The blindfolding procedure produced a Q^2 of 0.341, indicating medium-to-large predictive relevance. The standardised root mean square residual (SRMR) was 0.071, below the 0.08 threshold for acceptable fit.

Table 3. Explanatory Power, Predictive Relevance and Model Fit

Criterion	Value	Threshold / interpretation
R^2 (SEMP)	0.487	Moderate explanatory power
Q^2 (SEMP)	0.341	> 0; medium-to-large predictive relevance
SRMR	0.071	< 0.08; acceptable fit
ΔR^2 (RP × EA interaction)	0.028	Incremental variance explained
f^2 (RP × EA interaction)	0.048	Small-to-medium for moderation effects

4.3 Direct Effects

Table 4 reports the direct effects. Environmental awareness has a positive but weak effect on SEMP (β = 0.142, t = 1.847, p = .065). The effect is significant at the 10% level only, and the 95% confidence interval includes zero, so H1 receives marginal support. Corporate governance has a strong positive effect on SEMP (β = 0.327, t = 5.214, p < .001), supporting H2. Regulatory pressure has the largest effect (β = 0.384, t = 6.023, p < .001), supporting H3.

Table 4. Direct Effects on SEMP

Path	β	SE	t	p	95% CI	Decision
H1: EA → SEMP	0.142	0.077	1.847	.065	[−0.008, 0.292]	Supported (p < .10)
H2: CG → SEMP	0.327	0.063	5.214	< .001	[0.203, 0.451]	Supported
H3: RP → SEMP	0.384	0.064	6.023	< .001	[0.258, 0.510]	Supported

Note. Bootstrapping with 5,000 subsamples. CI = bias-corrected confidence interval; EA = environmental awareness; CG = corporate governance; RP = regulatory pressure.

4.4 Moderating Effects

Table 5 reports the interaction effects. Regulatory pressure positively and significantly moderates the relationship between environmental awareness and SEMP (β = 0.168, t = 2.847, p = .004), supporting H4. The interaction adds 2.8% to the explained variance in SEMP (ΔR^2 = 0.028, f^2 = 0.048). Simple slope analysis shows that awareness has a clear positive effect on SEMP when regulatory pressure is high (+1 SD: β = 0.276, p = .002) and practically no effect when it is low (−1 SD: β = 0.018, p = .812).

H5 is not supported. The interaction between regulatory pressure and corporate governance is significant but negative (β = −0.124, t = 2.214, p = .027). The positive effect of governance on SEMP therefore becomes weaker as regulatory pressure rises. This result runs against the hypothesised direction and is examined in Section 5.

Table 5. Moderating Effects of Regulatory Pressure

Path	β	SE	T	p	Decision
H4: RP × EA → SEMP	0.168	0.059	2.847	.004	Supported
Simple slope at high RP (+1 SD)	0.276	–	–	.002	–
Simple slope at low RP (−1 SD)	0.018	–	–	.812	–
H5: RP × CG → SEMP	−0.124	0.056	2.214	.027	Not supported (significant, negative)

Note. Interaction terms estimated with the product-indicator approach; significance based on 5,000 bootstrap subsamples.

4.5 Importance-Performance Map Analysis

The IPMA contrasts the total effect of each antecedent on SEMP (importance) with its mean score rescaled to 0–100 (performance). Following Ringle and Sarstedt (2016), importance is expressed as unstandardised total effects, which explains why these values differ from the standardised coefficients in Table 4. Regulatory pressure is the most important driver (0.412), followed by corporate governance (0.298) and environmental awareness (0.186). On performance, however, corporate governance scores lowest (52.3), behind environmental awareness (58.7) and regulatory pressure (64.2). Corporate governance therefore offers the greatest scope for improvement: it is the second most important driver of SEMP and the one on which firms currently perform worst (Table 6).

Table 6. Importance-Performance Map Analysis for SEMP

Construct	Importance (total effect)	Performance (0–100)	Priority
Regulatory pressure	0.412	64.2	Maintain and make enforcement more consistent
Corporate governance	0.298	52.3	Highest priority for improvement
Environmental awareness	0.186	58.7	Secondary; pair with incentives

Note. Importance values are unstandardised total effects on SEMP.

4.6 Summary of Hypothesis Tests

Table 7. Summary of Hypothesis Tests

Hypothesis	Expected sign	Result	Outcome
H1: EA → SEMP	+	β = 0.142, p = .065	Marginally supported
H2: CG → SEMP	+	β = 0.327, p < .001	Supported
H3: RP → SEMP	+	β = 0.384, p < .001	Supported
H4: RP × EA → SEMP	+	β = 0.168, p = .004	Supported
H5: RP × CG → SEMP	+	β = −0.124, p = .027	Not supported (opposite sign)

5. Discussion

5.1 Interpretation of Findings

The results describe SEMP adoption among Ghanaian SMEs as the product of several forces of unequal strength, with regulatory pressure shaping how the internal drivers operate. All three antecedents are

positively associated with SEMP, but the size of the effects differs considerably, and the two interactions point in opposite directions.

The weak effect of environmental awareness ($\beta = 0.142$, $p = .065$) fits the view that awareness is necessary but not sufficient for action. Ghanaian owner-managers are increasingly exposed to environmental information through the media, public campaigns, buyer requirements and their own networks (Ohemeng Sarpong et al., 2024; Paiva et al., 2024), yet knowledge does not translate readily into practice. Tight cash flows, competing operational demands and uncertainty about the returns to environmental investment stand in the way (Anisah et al., 2024; Durrani et al., 2024). The pattern echoes behavioural evidence from Ghana showing a persistent gap between environmental knowledge and environmental behaviour (M. K. Boakye et al., 2024). The contrast with the much larger effect of awareness on green investment readiness reported by Padi et al. (2026) is instructive: readiness is an intention, whereas SEMP is an established practice, and the step from one to the other appears to be where most of the effect is lost.

The strong effect of regulatory pressure ($\beta = 0.384$, $p < .001$) confirms that coercive institutional forces remain the main driver of SEMP. This is notable given the long-standing description of Ghana's regulatory system as under-resourced and inconsistently enforced (Efobi et al., 2019; Li et al., 2021). Even imperfect pressure appears to change behaviour, which suggests that SMEs respond to perceived expectations as much as to the actual probability of inspection. This is consistent with evidence from other SME populations that regulatory pressure is a leading predictor of environmental practice adoption (Madrid-Guijarro & Duréndez, 2024; Tyler et al., 2024).

The positive effect of corporate governance ($\beta = 0.327$, $p < .001$) shows that structure matters. Board or management oversight, clear allocation of responsibilities and engagement with stakeholders give SMEs the means to convert environmental intentions into routines. The finding sits comfortably with evidence that governance quality improves internal control and financial performance among Ghanaian SMEs (Musah et al., 2022; Padi & Musah, 2022; Padi et al., 2025) and strengthens the payoff from environmental practices (Adenutsi et al., 2025). It also agrees with research linking governance and environmental commitment to access to finance (Dzomonda, 2022).

The two interaction effects are the most informative results. Regulatory pressure strengthens the effect of awareness on SEMP ($\beta = 0.168$, $p = .004$): awareness has a clear effect where pressure is high and almost none where it is low. Credible enforcement, in other words, is what makes environmental knowledge commercially relevant to the owner-manager. Where the regulator is visible, the informed manager has a reason to act; where it is not, the same knowledge remains latent.

The negative interaction between regulatory pressure and corporate governance ($\beta = -0.124$, $p = .027$) requires careful interpretation. Three explanations, not mutually exclusive, are plausible. The first is substitution. When external pressure is strong, compliance may be driven directly by the threat of sanction and handled operationally, bypassing the board, so that governance adds less at the margin. Where pressure is weak, governance is one of the few forces keeping environmental issues on the agenda, and its contribution is correspondingly larger. The second is misalignment. Many SME boards and advisory structures were set up for general business oversight and lack the technical knowledge or procedures to respond to environmental regulation. Rising regulatory demands may expose that gap and create friction instead of synergy. The third is symbolic compliance. Intense pressure may encourage firms to produce visible signs of conformity, such as permits, policies and documents, rather than substantive change, which weakens the link between governance and actual practice. This is the decoupling that institutional theory predicts when formal structures are adopted mainly to satisfy external audiences (Meyer & Rowan, 1977).

Whichever mechanism dominates, the finding cautions against assuming that regulation and governance always reinforce each other. In the Ghanaian SME setting they appear to operate, at least in part, as alternative routes to the same outcome. This underlines the importance of designing governance arrangements that are specifically equipped for environmental decision-making and regulatory responsiveness, not merely for general oversight.

5.2 Theoretical Contributions

The study makes three theoretical contributions. First, it extends the NRBV to the antecedents of SEMP in SMEs by showing that environmental awareness is a foundational but insufficient resource. The NRBV attributes advantage to capabilities that are valuable and difficult to imitate (Hart, 1995). The results suggest that awareness becomes such a capability only when combined with governance mechanisms and institutional support, which supports the NRBV's emphasis on complementary resources and capability bundles.

Second, the study refines institutional theory by showing that regulatory pressure is not only a direct driver but also a contingency that shapes how internal factors work. Its positive moderation of the awareness–SEMP link shows coercive pressure activating latent intentions. Its negative moderation of the governance–SEMP link shows that the same pressure can crowd out internal mechanisms. The effect of institutional pressure is therefore not uniformly positive; it depends on the organisational arrangements it meets. This adds an SME and developing-economy perspective to the literature on decoupling and institutional complexity (DiMaggio & Powell, 1983; Meyer & Rowan, 1977; Scott, 2014).

Third, the study adds evidence from a weakly enforced, institutionally plural setting to a literature that draws heavily on developed economies. Where regulation is strong and predictable, awareness and governance may be the main differentiators between firms. In Ghana, where enforcement is uneven, the interplay between regulation and internal factors matters more, and the scope for misalignment is greater. Theoretical models of SME sustainability need to take account of this institutional heterogeneity.

5.3 Implications for Practice, Policy and Sustainability Accounting

The findings carry several practical implications for policymakers, regulators, SME owners and the accountancy profession in Ghana and comparable economies.

First, awareness campaigns on their own are unlikely to change practice. Policymakers and support agencies such as the Ghana Enterprises Agency should pair awareness initiatives with tangible incentives, including tax relief on energy-efficient equipment, concessionary green credit lines and subsidised technical advice, so that the business case for SEMP becomes concrete for the owner-manager.

Second, enforcement credibility is decisive. The strong positive moderation of the awareness–SEMP link shows that consistent, predictable enforcement converts knowledge into action. As the Environmental Protection Act, 2025 (Act 1124) is implemented, the Environmental Protection Authority should invest in monitoring capacity, simplify compliance procedures for small firms and publicise enforcement actions so that SMEs see the rules as binding and not merely aspirational.

Third, governance needs to be equipped for environmental matters. The IPMA identifies corporate governance as the area with the greatest room for improvement, and the negative interaction suggests that existing structures are poorly matched to regulatory demands. SME boards and advisory bodies should place environmental performance on their regular agenda, assign named responsibility for compliance and seek members with relevant expertise. Business associations and regulators could support this with model governance charters that include environmental responsibilities and with short training programmes for SME directors.

Fourth, accountants are well placed to close the gap between governance and practice. Simple environmental management accounting tools, such as tracking energy and water use per unit of output, logging waste volumes and costs, and costing environmental incidents, would give boards the information needed to oversee SEMP and respond to regulators on the basis of evidence. Professional accountancy bodies, including the Institute of Chartered Accountants, Ghana, can promote proportionate environmental reporting guidance for SMEs, building on existing evidence that governance shapes the quality of social and environmental disclosure (Coffie et al., 2018). As international sustainability disclosure standards spread through supply chains and lending decisions, such preparation will become a commercial necessity for SMEs that supply larger firms or seek external finance.

Fifth, interventions should be differentiated. For SMEs with weak governance, regulatory pressure is likely to be the main lever. For those with stronger governance, policy should focus on helping existing structures respond effectively to regulatory requirements. A uniform approach is unlikely to work well across a sector as diverse as Ghana's SMEs.

5.4 Limitations and Directions for Future Research

Several limitations should be acknowledged. First, the cross-sectional design limits causal inference. The ordering of constructs rests on theory, and the temporal separation applied to a subsample reduces common method concerns, but longitudinal or panel designs are needed to establish causality and trace how SEMP develops over time, particularly as Act 1124 takes effect. Second, the data are self-reported and may contain perceptual or social desirability bias. Future studies could combine survey measures with objective data such as utility bills, waste records and regulatory compliance files. Third, the study is confined to Ghana, and generalisation to other developing economies should take account of institutional differences. Fourth, the negative interaction between regulatory pressure and governance calls for closer investigation. Qualitative case studies of SME boards could reveal whether substitution, misalignment or symbolic compliance best explains the effect. Fifth, the study did not examine sectoral differences, which may be considerable given variation in environmental intensity and regulatory scrutiny across manufacturing, agro-processing, services and retail. Multi-group analysis by sector and firm size is a natural next step.

6. Conclusion

This study examined how environmental awareness, corporate governance and regulatory pressure influence the adoption of SEMP among Ghanaian SMEs, and whether regulatory pressure moderates the effects of the internal drivers. Using PLS-SEM on data from 450 SMEs, it found that all three antecedents are positively associated with SEMP, although the effect of awareness is weak and significant only at the 10% level. Regulatory pressure strengthens the awareness–SEMP relationship, confirming the role of credible enforcement in turning knowledge into practice. It weakens the governance–SEMP relationship, pointing to substitution or misalignment between internal governance and external regulation.

By combining the NRBV and institutional theory, the study shows that SEMP adoption does not rest on any single factor. It emerges from the interaction of individual cognition, organisational structure and institutional pressure. Effective policy must therefore work on all three at once: strengthening enforcement under the new environmental law, building governance capacity for environmental decision-making within SMEs, and offering tangible incentives that make environmental investment worthwhile. For Ghana and similar economies, progress towards sustainable SMEs depends on aligning what firms are able to do internally with what institutions expect of them.

Declarations

Ethical approval. The study was approved by the Ethics Review Committee of Takoradi Technical University, Ghana (approval number TTU/ERC/25/054). All procedures were conducted in accordance with the committee's guidelines.

Informed consent. Informed consent was obtained from all participants before data collection. Participation was voluntary and anonymous.

Data availability. The data supporting the findings of this study are available from the corresponding author on reasonable request.

Competing interests. The authors declare no competing interests.

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Author contributions. Alhassan Musah: conceptualisation, methodology, formal analysis, writing – original draft, writing – review and editing. Abigail Padi: conceptualisation, supervision, validation, writing – review and editing. John Kinyorbaan Gabulja: investigation, data curation, writing – review and editing. George Akudugu Mbawini: investigation, resources, data curation, writing – review and editing. All authors read and approved the final manuscript.

References

1. Adebanjo, D., Teh, P. L., & Ahmed, P. K. (2016). The impact of external pressure and sustainable management practices on manufacturing performance and environmental outcomes. International Journal of Operations & Production Management, 36(9), 995–1013.

2. Adenutsi, D. E., Musah, A., & Padi, A. (2025). Sustainable environmental management practices and financial performance of SMEs in Ghana: The role of board effectiveness. Discover Global Society, 3, Article 64.
3. Ahinful, G. S., & Tauringana, V. (2019). Environmental management practices and financial performance of SMEs in Ghana. In Environmental reporting and management in Africa (pp. 127–157). Emerald Publishing Limited.
4. Aiken, L. S., & West, S. G. (1991). Multiple regression: Testing and interpreting interactions. Sage.
5. Anaman, P. D., Ahmed, I. A., Suleman, A. R., & Dzakah, G. A. (2023). Environmentally sustainable business practices in micro, small, and medium enterprises: A sub-Saharan African country perspective. Business Perspectives and Research. Advance online publication.
6. Anisah, H. U., Wandary, W., & Wijayanti, A. W. (2024). Factors contributing to environmentally friendly business practices in SMEs (small and medium enterprises) with a focus on process performance and resources: Study of local culinary SMEs in North Kuin Village, South Kalimantan, Indonesia. Open Access Indonesia Journal of Social Sciences, 7(3), 1524–1533.
7. Baah, C., Afum, E., Agyabeng-Mensah, Y., Dacosta, E., Opoku-Agyeman, D., & Nyame, C. (2022). Environmental orientation, relational capital and SMEs performance: Do religious, cultural and mimetic orientations matter in a Sub-Saharan African economy? Benchmarking: An International Journal, 29(1), 215–233.
8. Boakye, D. J., Tingbani, I., Ahinful, G., Damoah, I., & Tauringana, V. (2020). Sustainable environmental practices and financial performance: Evidence from listed small and medium-sized enterprise in the United Kingdom. Business Strategy and the Environment, 29(6), 2583–2602.
9. Boakye, M. K., Adanu, S. K., Agbosu, W. K., Lissah, S. Y., Abdul-Aziz, A. R., & Owusu, A. G. (2024). Behavioral factors influencing the acceptance and usage of waste bins in Ghana: Application of the extended theory of planned behavior (TPB). Management of Environmental Quality: An International Journal, 35(5), 986–1004.
10. Coffie, W., Aboagye-Otchere, F., & Musah, A. (2018). Corporate social responsibility disclosures (CSRD), corporate governance and the degree of multinational activities: Evidence from a developing economy. Journal of Accounting in Emerging Economies, 8(1), 106–123.
11. Das, M. (2024). Impact of social and environmental practices on SME business performance [Preprint]. Authorea.
12. DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48(2), 147–160.
13. Durrani, N., Raziq, A., Mahmood, T., & Khan, M. R. (2024). Barriers to adaptation of environmental sustainability in SMEs: A qualitative study. PLOS ONE, 19(5), Article e0298580.
14. Dzomonda, O. (2022). Environmental sustainability commitment and access to finance by small and medium enterprises: The role of financial performance and corporate governance. Sustainability, 14(14), Article 8863.
15. Efobi, U., Belmondo, T., Orkoh, E., Atata, S. N., Akinyemi, O., & Beecroft, I. (2019). Environmental pollution policy of small businesses in Nigeria and Ghana: Extent and impact. Environmental Science and Pollution Research, 26, 2882–2897.
16. Environmental Protection Act, 2025 (Act 1124). Parliament of the Republic of Ghana.
17. Environmental Protection Agency Act, 1994 (Act 490). Parliament of the Republic of Ghana.
18. Famiyeh, S., & Kwarteng, A. (2018). Implementation of environmental management practices in the Ghanaian mining and manufacturing supply chains. International Journal of Productivity and Performance Management, 67(7), 1091–1112.
19. Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 41(4), 1149–1160.
20. Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39–50.
21. Ghana Statistical Service. (2024). 2024 Integrated Business Establishment Survey I (IBES I): Volume 3. Ghana Statistical Service.
22. Gomes, S., Pinho, M., & Lopes, J. M. (2024). From environmental sustainability practices to green innovations: Evidence from small and medium-sized manufacturing companies. Corporate Social Responsibility and Environmental Management, 31(3), 1677–1687.
23. Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). Sage.
24. Hart, S. L. (1995). A natural-resource-based view of the firm. Academy of Management Review, 20(4), 986–1014.
25. Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43(1), 115–135.
26. Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. International Journal of e-Collaboration, 11(4), 1–10.
27. Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. Information Systems Journal, 28(1), 227–261.
28. Li, G., Koomson, D. A., Huang, J., Amponsah, E. I., Darkwah, W. K., Miwornunyuie, N., Li, Y., & Dong, X. (2021). A review from environmental management to environmental governance: Paradigm shift for sustainable mining practice in Ghana. Environment, Development and Sustainability, 23, 9710–9724.
29. Madrid-Guijarro, A., & Duréndez, A. (2024). Sustainable development barriers and pressures in SMEs: The mediating effect of management commitment to environmental practices. Business Strategy and the Environment, 33(2), 949–967.
30. Meyer, J. W., & Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. American Journal of Sociology, 83(2), 340–363.
31. Mitra, S. (2024). Investigating the effect of organisational values on sustainable practices and the moderating role of family influence in Indian SMEs. IIMB Management Review, 36(2), 99–112.

32. Musah, A., Padi, A., Okyere, B., Adenutsi, D. E., & Ayariga, C. (2022). Does corporate governance moderate the relationship between internal control system effectiveness and SMEs financial performance in Ghana? Cogent Business & Management, 9(1), Article 2152159.
33. Ohemeng Sarpong, E., Yunfei, S., Coffie, C. P. K., & Akrong, G. B. (2024). Empirical evidence of inbound open innovation practice by Ghanaian SMEs. SAGE Open, 14(2).
34. Padi, A., & Musah, A. (2022). The influence of corporate governance practices on financial performance of small and medium-sized enterprises in Ghana. The Indonesian Journal of Accounting Research, 25(2), 249–270.
35. Padi, A., Musah, A., Blay, M. W., & Okyere, D. O. (2025). Small and medium scale enterprise (SME) owner financial literacy, entrepreneurial competencies and financial performance: The role of corporate governance. Future Business Journal, 11(1), Article 160.
36. Padi, A., Musah, A., Blay, M. W., & Okyere, D. O. (2026). Financial literacy, environmental awareness and green investment readiness in renewable energy adoption by SMEs in Ghana. Discover Sustainability, 7(1), Article 537.
37. Paiva, I. C. D. S., Sánchez-Hernández, M. I., & Carvalho, L. C. (2024). CSR information, environmental awareness and CSR diffusion in SMEs of Angola. Journal of Accounting in Emerging Economies, 14(3), 489–512.
38. Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology, 88(5), 879–903.
39. Ringle, C. M., & Sarstedt, M. (2016). Gain more insight from your PLS-SEM results: The importance-performance map analysis. Industrial Management & Data Systems, 116(9), 1865–1886.
40. Ringle, C. M., Wende, S., & Becker, J.-M. (2022). SmartPLS 4 [Computer software]. SmartPLS GmbH.
41. Scott, W. R. (2014). Institutions and organizations: Ideas, interests, and identities (4th ed.). Sage.
42. Seroka-Stolka, O., & Fijorek, K. (2020). Enhancing corporate sustainable development: Proactive environmental strategy, stakeholder pressure and the moderating effect of firm size. Business Strategy and the Environment, 29(6), 2338–2354.
43. Tyler, B. B., Lahneman, B., Cerrato, D., Cruz, A. D., Beukel, K., Spielmann, N., & Minciullo, M. (2024). Environmental practice adoption in SMEs: The effects of firm proactive orientation and regulatory pressure. Journal of Small Business Management, 62(5), 2211–2246.

Appendix A: Measurement Items

Table A1

Survey Items by Construct

Code	Item
Environmental awareness (EA)	
EA1	I am aware of the environmental impacts of our business operations.
EA2	I understand the business case for environmental management.
EA3	I keep informed about environmental issues relevant to our industry.
EA4	I recognise the importance of environmental protection for our community.
EA5	I am aware of our firm's environmental responsibilities.
Corporate governance (CG)	
CG1	Our firm has clear decision-making structures for environmental matters.
CG2	The board/management regularly discusses environmental performance.
CG3	Our firm has formal accountability mechanisms for environmental outcomes.
CG4	Stakeholders are engaged in environmental decision-making.
CG5	Our governance structures support long-term sustainability objectives.
CG6	Environmental responsibilities are clearly assigned within our organisation.
Regulatory pressure (RP)	
RP1	Environmental regulations are strictly enforced in our sector.
RP2	Non-compliance with environmental regulations carries significant penalties.
RP3	Regulatory authorities regularly monitor our environmental performance.
RP4	We face pressure from regulators to improve environmental practices.
RP5	Compliance with environmental regulations is essential for our business.

Code	Item
Sustainable environmental management practices (SEMP)	
SEMP1	Our firm implements waste reduction practices.
SEMP2	Our firm invests in energy-efficient equipment and processes.
SEMP3	Our firm has water conservation measures in place.
SEMP4	Our firm takes steps to protect local biodiversity.
SEMP5	Our firm reports on environmental performance to stakeholders.
SEMP6	Our firm uses environmentally friendly materials where possible.
SEMP7	Our firm has environmental management policies and procedures.
SEMP8	Our firm trains employees on environmental practices.

Note. All items were rated on a five-point scale from 1 (strongly disagree) to 5 (strongly agree).