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Sustainable Supply Chain Performance in Emerging Markets: The Influence of Green Procurement, Carbon Management, and Stakeholder Pressure

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ABSTRACT: This research explores the ways in which green procurement and carbon management practices contribute to sustainable supply chain performance in emerging markets, while also investigating how stakeholder pressure moderates these relationships. Anchored in Institutional Theory and the Natural Resource-Based View, the study treats sustainable supply chain performance as a multifaceted outcome influenced by deliberate sourcing choices, structured carbon reduction efforts, and external pressures for legitimacy. Using a quantitative cross-sectional approach, the authors gathered responses from 385 supply chain practitioners, sustainability officers, and sector specialists through an online 5-point Likert-scale survey. Data analysis, performed in SPSS, included checks for reliability, exploratory factor analysis, multiple regression models, and moderation testing via Hayes' PROCESS macro. The results demonstrate that green procurement (β = 0.666) and carbon management practices (β = 0.688) each exert a robust, highly significant positive influence on sustainable supply chain performance. In addition, stakeholder pressure markedly enhances the effect of carbon management on performance outcomes (β = 0.565), illustrating how institutional demands can substantially reinforce internal environmental initiatives. Collectively, the evidence suggests that strong sustainability performance in emerging-market supply chains emerges not from standalone green efforts, but from the thoughtful alignment of procurement strategies, carbon-focused governance, and proactive stakeholder collaboration. By synthesizing institutional and resource-based lenses, this work enriches theoretical insights and delivers practical guidance for managers and policymakers navigating sustainability challenges in institutionally complex environments.

KEYWORDS: Sustainable supply chain performance; Green procurement; Carbon management practices; Stakeholder pressure; Emerging markets.

1. INTRODUCTION

Sustainable supply chain performance continues to pose a major research challenge in emerging markets, since supply chains are responsible for the bulk of environmental burdens—most notably Scope 3 emissions—while at the same time determining cost structures, delivery reliability, and social consequences under conditions of resource scarcity and institutional voids. Still, empirical evidence on the performance benefits of sustainability-oriented supply chain practices remains inconsistent; meta-analytic reviews indicate generally positive but markedly heterogeneous impacts across operational, economic, environmental, and social dimensions, highlighting pronounced context dependence instead of automatic win–win scenarios (Wang et al., 2023). Implementation differences are a central issue: although green procurement frequently supports gains in multiple sustainability areas, its effectiveness varies substantially by country, industry, and firm size, which means that so-called best practices rarely transfer straightforwardly into emerging-market contexts (Liu et al., 2025). Measurement issues add further complexity, because carbon management initiatives typically integrate supplier involvement, long-term planning, and transparency efforts—yet weak disclosure standards can prevent these combined actions from delivering measurable performance improvements (Subramanyam & Anand, 2025). Finally, stakeholder pressure produces uneven results; it sometimes reinforces particular sustainability–performance relationships while simultaneously diluting or disrupting others, thereby complicating both managerial decision-making and efforts to establish clear causal links (Li et al., 2025).

Although prior and current studies generally point to a favorable connection between sustainable or green supply chain practices and various performance measures, the findings are far from consistent—meta-analytic work reveals substantial variation in effects across economic, operational, environmental, and social dimensions (Holling et al., 2023). Research specifically on green

procurement suggests that improvements tend to show up more reliably in operational efficiency than in wider sustainability results, with outcomes heavily influenced by industry maturity and the strength of institutions—factors that remain particularly unstable in emerging markets (Liu et al., 2025). Investigations into carbon management and low-carbon initiatives indicate that their adoption hinges on firm capabilities and sector-specific pressures, while actual performance benefits depend on genuine integration rather than superficial reporting (Fu et al., 2023). At the same time, stakeholder pressure acts as a mixed influence: it often bolsters the impact of process-oriented sustainability efforts but can simultaneously undermine other supply chain pathways, making it trickier for managers to set priorities and for scholars to draw clean causal conclusions (Li et al., 2025). To help close these gaps, the present study employs a multidimensional measure of sustainable supply chain performance, treats green procurement and carbon management as separate yet potentially interacting drivers, and examines stakeholder pressure as a moderating factor while applying robustness tests to address endogeneity and common-method concerns.

Then, this study seeks to answer the research questions as follows:

(1) To what extent does green procurement influence sustainable supply chain performance in emerging markets?
(2) How do carbon management practices affect sustainable supply chain performance in emerging market contexts?
(3) How does stakeholder pressure moderate the relationship between carbon management practices and sustainable supply chain performance?

Accordingly, this research seeks to assess the direct influence of green procurement on environmental, operational, and economic aspects of sustainable supply chain performance; to explore how carbon management practices serve as strategic levers for building long-term resilience and environmental responsibility; and to determine whether and how stakeholder pressure amplifies or limits the ability of carbon management to deliver stronger sustainability outcomes. The study's academic contribution stems from its integrated, context-aware perspective—by jointly analyzing procurement choices, carbon-focused strategies, and stakeholder contingencies in emerging-market settings, it moves beyond isolated practice models toward a richer theoretical account of the governance mechanisms and institutional forces that shape sustainable supply chain performance.

2. LITERATURE REVIEW

2.1. Sustainable Supply Chain Performance

Sustainable supply chain performance (SSCP) captures the degree to which supply chain operations deliver economic value while simultaneously safeguarding the environment and upholding social responsibilities throughout upstream and downstream activities, ultimately fostering enduring competitive edges and broader stakeholder benefits (Ahi & Searcy, 2013; Dubey et al., 2019). In contrast to conventional supply chain metrics that focus narrowly on cost reduction, quality consistency, and timely delivery, SSCP weaves the Triple Bottom Line—economic, environmental, and social—into every stage, from sourcing and manufacturing to logistics and distribution (Touboulic & Walker, 2015). Theoretically, SSCP goes beyond mere regulatory compliance to emerge as a genuine strategic resource; grounded in stakeholder theory and the resource-based view, it builds legitimacy, strengthens resilience, and cultivates valuable relationships with suppliers, buyers, regulators, and local communities (Touboulic & Walker, 2015). Empirical work supports this view, showing that companies which integrate sustainability deeply into supply chain governance tend to achieve stronger long-run performance and better risk management, especially amid environmental volatility and shifting regulations (Dubey et al., 2019). In this sense, SSCP serves as a vital bridge, channeling the effects of practices like green procurement and carbon management into wider organizational sustainability gains. In emerging markets, however, realizing SSCP brings both promise and significant hurdles: institutional gaps, lax enforcement, and pressure to keep costs low often hinder effective adoption (Khanna & Palepu, 2010), even as growing demands from stakeholders, international buyers, and ESG-focused investors drive greater transparency and greener practices (Yakovleva et al., 2012). Studies from Asian and African settings reveal that although many firms are embracing green supply chain approaches, results vary widely because of differences in capabilities, infrastructure, and context; for instance, sustainable supply chain efforts among manufacturers in developing economies frequently boost environmental and operational outcomes but produce inconsistent financial returns, depending heavily on the quality of institutions and managerial skills (Vijayvargy et al., 2017). Taken together, SSCP stands as a complex, multifaceted construct essential for reconciling profitability with sustainability, yet its successful development in emerging markets hinges critically on the interplay of institutional conditions, stakeholder pressures, and the thoughtful embedding of environmental strategies.

2.2. Critical Analysis of Theoretical Frameworks

2.2.1. Institutional Theory

Institutional theory bolsters the conceptual framework by shedding light on why companies in emerging markets choose to embrace—or sometimes sidestep—green procurement and carbon management practices when faced with external forces that define what counts as legitimate conduct. Operating through three core channels—coercive pressures from laws, regulators, and enforceable rules; normative influences stemming from professional standards, industry associations, and societal values; and mimetic processes where firms copy what appear to be effective strategies adopted by respected peers—institutions guide organizational behavior most powerfully in uncertain environments where clear market feedback is lacking (Scott, 1995). Applied to sustainable supply chains, this perspective reframes green procurement as far more than a straightforward economic calculation: it frequently emerges as a reaction to demands from powerful buyers, certification bodies, regulatory bodies, and competitive landscapes that reshape norms around supplier vetting, auditing protocols, and raw material choices. Supporting evidence from surveys shows that these institutional pressures consistently propel the adoption of green supply chain initiatives, with coercive, normative, and mimetic forces exerting distinct effects on internal operations versus external collaborations and ultimately on performance (Saeed et al., 2018). Likewise, studies of firms in eco-industrial parks reveal that institutional demands play a pivotal role in steering sustainable relationship management and network design, demonstrating how broader institutional contexts can structurally orient supply chains toward sustainability (Zeng et al., 2017). In the proposed model, institutional theory provides solid grounding for positioning stakeholder pressure as a moderator: it effectively captures the array of institutional demands (from regulators, customers, NGOs, and investors) that can heighten the returns to carbon management practices by amplifying oversight, elevating reputational risks and rewards, and linking credible emissions reductions to better access to contracts, financing, and social approval. At the same time, the theory cautions that weak monitoring—common in many emerging markets—can push firms toward superficial or symbolic responses rather than deep operational change, underscoring the need to carefully differentiate substantive carbon management (involving actual measurement, reduction efforts, and supplier collaboration) from mere disclosure. On a broader supply chain scale, institutional theory anticipates spillover and diffusion: as frontrunners enforce supplier codes, mandate emissions reporting, or set low-carbon targets, other actors up and down the chain often follow suit to maintain legitimacy and market position, a pattern backed by findings that institutional forces shape distinct styles of green practice and that customer-driven coercion frequently dominates downstream dynamics (Hoejmose et al., 2014).

Institutional theory assumes that firms are embedded in rule systems and social expectations that define legitimacy, and that organizations often pursue legitimacy alongside efficiency. It presumes that external pressures (regulatory, normative, competitive) can shape internal routines and inter-firm governance, and that uncertainty increases reliance on imitation. It also assumes that pressure intensity and monitoring vary across contexts, so adoption patterns and performance outcomes reflect institutional environments as well as firm choice (Scott, 1995).

2.2.2. Natural Resource-Based View (NRBV)

The natural resource-based view (NRBV) nicely rounds out institutional theory in this framework by illuminating the internal pathway through which firms transform sustainability-focused practices into tangible sustainable supply chain performance, treating these practices as deliberate investments in rare, valuable, and hard-to-imitate resources and capabilities. Building directly on the resource-based view, NRBV posits that lasting competitive advantage now hinges on developing environmentally sound capabilities—most notably pollution prevention, product stewardship, and broader sustainable development—that allow firms to thrive while addressing ecological limits (Hart & Dowell, 2011). In the context of this study, NRBV offers a clear theoretical link from green procurement and carbon management practices to sustainable supply chain performance (SSCP): green procurement acts as a strategic capability for reshaping supply inputs, forging supplier partnerships around lower-impact materials and cleaner processes, and embedding lifecycle thinking into sourcing decisions, whereas carbon management serves as a capability centered on systematically measuring, reducing, and controlling emissions throughout operations and the extended value chain. Far from being standalone initiatives, these become capability-enhancing efforts that deliver concrete benefits—cost savings through resource efficiency, reduced exposure to regulatory risks and supply disruptions, and market differentiation that opens doors to environmentally conscious buyers and investors. Hart and Dowell's updated synthesis underscores that while early empirical attention centered on pollution prevention's ties to profitability, the fuller NRBV logic embraces innovation-driven and market-creating pathways, which resonate strongly with today's low-carbon supply chain approaches that demand tight coordination across functions and deep supplier engagement. In emerging markets especially, NRBV suggests that building such environmental capabilities offers a powerful way to overcome resource and institutional constraints—firms can leapfrog outdated technologies, elevate procurement standards to satisfy global buyers, and break into export or premium markets as a result. This logic finds support in studies showing that green supply chain strategies in emerging economies

respond to policy signals and customer demands while subsequently guiding the actual design and rollout of sustainable practices (Jayaram & Avittathur, 2015). Moreover, NRBV dovetails with the broader recognition that sustainable supply chain management draws on multiple theoretical lenses, with institutional and resource-based perspectives ranking among the most prominent and highlighting the interplay between external legitimacy and internal capability development (Touboulic & Walker, 2015). Within the paper's model, stakeholder pressure emerges as a key contingency that can amplify NRBV's value-creation process: when pressure is intense, firms tend to embed carbon management capabilities more thoroughly across supply chain tiers—through supplier emissions targets, optimized logistics, and integrated data systems—thereby strengthening the connection between these practices and meaningful SSCP gains. Overall, NRBV anchors the framework's "inside-out" dynamic, positioning capabilities cultivated via green procurement and carbon management as the primary drivers of performance, while stakeholder pressure shapes how fully and effectively those capabilities are activated and scaled.

NRBV assumes that firm heterogeneity in environmental resources and capabilities explains differences in sustainability and competitive performance, and that such capabilities can be valuable, difficult to imitate, and strategically deployable across the supply chain. It presumes that environmental constraints and stakeholder expectations make pollution prevention, stewardship, and sustainable development capabilities increasingly relevant, and that managers can purposefully build and reconfigure these capabilities over time to secure advantage and performance gains (Hart & Dowell, 2011).

2.3. The Impact of Green Procurement

Green procurement (GP) involves deliberately weaving environmental concerns into purchasing choices to curb negative ecological effects throughout a product's entire lifecycle, all while safeguarding economic viability and social accountability (Testa et al., 2016; Walker & Brammer, 2012). Far removed from traditional procurement's narrow focus on price, quality, and on-time delivery, GP incorporates sustainability factors—eco-design principles, suppliers' environmental track records, carbon footprint cuts, and full lifecycle assessments—directly into sourcing decisions (Zhu et al., 2013). Philosophically, it draws strength from ecological economics, which rejects the notion of infinite resources and insists that environmental costs must be reflected in market dealings, thereby shifting procurement from a short-term cost-cutting exercise to a forward-looking tool for ecological stability and economic durability (Daly & Farley, 2011). In emerging markets, where rules on the environment are frequently lax and enforcement spotty, GP emerges as an essential self-regulating mechanism that helps offset institutional shortcomings and nudges companies onto more sustainable paths (Geng et al., 2017).

Theoretically, GP finds firm footing in the natural resource-based view, which holds that forward-thinking environmental approaches build unique, hard-to-copy capabilities that fuel lasting competitive edges (Hart & Dowell, 2011); through eco-innovation, closer supplier ties, and smarter resource use, GP paves the way for genuine value creation and sustained operational gains (Laari et al., 2016). Yet its spread in emerging economies remains patchy: while global corporations push green sourcing norms, local firms often grapple with tight budgets, outdated technology, and feeble regulatory oversight (Zhu et al., 2013; Geng et al., 2017). Research from places like Southeast Asia, China, and India points to external drivers—export demands, multinational buyer insistence, and reputation risks—outweighing purely internal environmental motives, revealing a pragmatic blend of economic self-interest and gradually deepening ethical awareness (Liu et al., 2016; Agyabeng-Mensah et al., 2021). A robust stream of evidence links GP strongly to improved sustainable supply chain performance (SSCP), showing gains in resource productivity, lower waste and emissions, better supplier compliance, greater transparency, and stronger environmental, operational, and reputational results (Laari et al., 2016; Agyabeng-Mensah et al., 2021). Viewed through systems theory, GP acts as a key upstream lever that synchronizes supplier actions with downstream sustainability goals, creating reinforcing cycles across the chain (Zhu et al., 2013); studies of manufacturing in China and ASEAN countries confirm that GP markedly boosts environmental outcomes, cost savings, and supply chain durability (Liu et al., 2016; Geng et al., 2017), lending support to ecological modernization's claim that green innovation can deliver joint ecological and economic wins (Bush & Spaargaren, 2024). Still, not all findings are uniformly glowing—some research highlights moderate or highly situational benefits in emerging settings marked by institutional fragility and fragmented supplier bases, where steep costs, supplier pushback, weak oversight, and greenwashing tendencies can blunt GP's impact on SSCP (Walker & Brammer, 2012; Testa et al., 2016; Luthra et al., 2016). From an institutional economics angle, GP's success hinges on solid regulation, active stakeholder oversight, and clear market rewards (North, 1990); in weakly governed contexts, it risks turning ceremonial rather than transformative, yielding compliance gestures instead of real change (Zhu et al., 2013).

Balancing these views, GP stands as a vital strategic capability that bolsters SSCP by guiding supplier conduct, curbing environmental harm, and building enduring resilience—yet in emerging markets its full potential depends crucially on the presence of institutional pressures and effective monitoring to tip the balance toward substantive rather than superficial outcomes.

H1: Green procurement has a positive impact on sustainable supply chain performance in emerging markets.

2.4. The Impact of Carbon Management Practices

Carbon management practices (CMP) encompass a broad array of organizational approaches—strategies, policies, technologies, and day-to-day actions—designed to systematically track, monitor, cut, and where necessary offset carbon emissions throughout operations and entire supply chains (Lee et al., 2014; Schaltegger & Csutora, 2012). These efforts typically involve carbon accounting and disclosure, energy-saving programs, shifts toward low-carbon transport and renewable sources, and active engagement with suppliers on emissions reduction (Böttcher & Müller, 2015).

Seen through an institutional-economic lens, CMP reflects companies' calculated responses to mounting regulatory demands, market incentives, and stakeholder expectations, all while positioning environmental accountability as a source of competitive strength (Zhu et al., 2013). The natural resource-based view (NRBV) further anchors CMP's importance, arguing that such forward-leaning environmental efforts build distinctive, hard-to-replicate capabilities that drive superior long-term performance (Hart & Dowell, 2011), while institutional theory highlights how firms in emerging markets often adopt these practices mainly to meet coercive rules, normative pressures from professional communities, and mimetic signals from industry leaders (Tashman et al., 2019). Philosophically, CMP signals a deeper transition away from purely human-centered growth models toward an ecological rationality that respects planetary limits and obligations to future generations (Rockström et al., 2009). On the economic front, CMP helps internalize previously externalized environmental costs, thereby lowering future transaction expenses, hedging against regulatory risks like carbon pricing, and easing exposure to volatile energy markets (Busch & Hoffmann, 2011). Growing global awareness, tighter supply chain linkages, and the rise of ESG-focused investment have further sped up CMP uptake across industries (Delmas & Burbano, 2011). In turn, CMP markedly strengthens sustainable supply chain performance (SSCP) by boosting environmental efficiency, fortifying operational robustness, and building greater trust among stakeholders (Zhu et al., 2010; Lee et al., 2014); proactive emissions cuts allow firms to streamline logistics, slash unnecessary energy use, deepen green supplier partnerships, and ultimately deliver more resilient and sustainable chain outcomes (Luthra et al., 2016). From a pure efficiency standpoint, these practices often translate into lasting cost reductions and protection from carbon-related penalties, creating mutually reinforcing benefits between sustainability goals and financial health (Busch & Hoffmann, 2011). Empirical work, especially in manufacturing and export-driven sectors, consistently shows CMP exerting a robust positive influence on SSCP (Zhu et al., 2010). That said, scholars continue to debate the strength and consistency of these effects: in settings with limited institutional backing, technological infrastructure, or financial resources—common in many emerging markets—the benefits of CMP can appear more modest or highly situational, with upfront costs sometimes delaying or diluting returns and leading to gradual rather than sweeping improvements (Tashman et al., 2019). This ongoing discussion mirrors a fundamental tension between instrumental, cost-benefit reasoning and a more substantive commitment to ethical and ecological responsibility that shapes choices in resource-scarce contexts (Schaltegger & Csutora, 2012).

Bringing together insights from NRBV, institutional theory, and ecological economics, CMP emerges as both a powerful strategic asset and an ethical necessity, enabling firms to harmonize operational effectiveness with genuine sustainability aims; despite real-world limitations, the weight of evidence increasingly affirms that well-executed CMP meaningfully elevates supply chain sustainability.

H2: Carbon management practices have a positive impact on sustainable supply chain performance.

2.5 The moderating role of Stakeholder Pressure

Stakeholder pressure (SP) captures the degree to which companies sense compelling demands—coercive, normative, and mimetic—from a wide array of internal and external actors, such as regulators, investors, buyers, workers, suppliers, NGOs, and nearby communities, urging them to embrace environmentally sound practices and elevate sustainability results (Aguilera et al., 2018; Tashman et al., 2019). Rooted in institutional theory, SP emerges as a multifaceted driver that molds corporate environmental conduct through enforced rules, the pursuit of social acceptance, and the urge to match industry leaders (DiMaggio & Powell, 1983; Shnayder et al., 2016). On a psychological level, it taps into impulses toward conformity, a sense of moral duty, and worries about reputation, pushing organizations to synchronize their actions with broader societal values (Bansal & Clelland, 2004). Sociologically, SP mirrors shifting cultural standards that increasingly frame environmental care as both an ethical duty and a smart business move within interconnected global supply networks (Schaltegger et al., 2019).

Crucially, SP acts as a powerful moderator of the link between carbon management practices (CMP) and sustainable supply chain performance (SSCP), intensifying leadership dedication, speeding up rollout efforts, and deepening organizational learning (Zailani et al., 2015). From an institutional standpoint, the blend of coercive rules and normative expectations often nudges firms past token gestures toward genuine, in-depth carbon cuts, thereby magnifying CMP's contributions to performance (Tashman

et al., 2019). Philosophically, SP embodies the call for social accountability, casting businesses as ethical actors obliged to limit ecological damage and embedding CMP more firmly into core strategy rather than leaving it on the margins (Schaltegger et al., 2019). Psychologically, stronger SP heightens sensitivity to reputational risks and social backlash, spurring more proactive emissions governance and closer ties with supply chain partners (Bansal & Clelland, 2004). Sociologically, it cultivates collective sustainability norms that encourage joint efforts across the chain, boosting CMP's overall impact on SSCP (Gualandris et al., 2015). Empirical studies back this moderating strength: in emerging-economy supply chains, Kumar et al. (2021) show that heightened stakeholder scrutiny markedly enhances the positive tie between CMP and sustainability gains, while Zailani et al. (2015) illustrate how regulatory and customer demands amplify operational and environmental returns from carbon initiatives in manufacturing. In export-heavy sectors, buyer-imposed green standards further sharpen CMP execution and yield better sustainability results (Tachizawa et al., 2015). These patterns position SP as a catalyst that elevates CMP from routine measures to key drivers of lasting value. Yet the picture is not entirely uniform—research also points to boundary conditions: in settings plagued by institutional gaps, lax enforcement, or disjointed stakeholder voices, SP's influence can weaken, softening the CMP–SSCP connection and sometimes fostering superficial responses or outright greenwashing with little real change (Marquis et al., 2016; Tashman et al., 2019). Overwhelming or contradictory demands may even create resource strain, decision fatigue, or strategic overload that dampens CMP effectiveness (Delmas & Burbano, 2011). From a socio-psychological angle, clashing expectations can spark internal tension and erode managerial resolve, further limiting carbon management's payoff (Aguilera et al., 2018). This ongoing tension underscores the classic clash between profit-driven logic and ethical-environmental commitment, a divide felt especially keenly in emerging markets balancing growth needs with sustainability pressures (Schaltegger et al., 2019). Still, the bulk of evidence leans toward a clear conclusion: when stakeholder pressure is unified, credible, and reliably enforced, it substantially boosts CMP's ability to deliver stronger SSCP. Thus, SP should be viewed not just as an outside force but as a vital, dynamic element of governance that shapes how effectively carbon management translates into sustainable supply chain success. Bringing together institutional, psychological, and sociological insights, stakeholder pressure stands out as a pivotal contingency—when demands are robust and consistent, firms tend to invest more deeply in CMP, unlocking markedly better outcomes for supply chain sustainability.

H3: Stakeholder pressure positively moderates the influence of carbon management practices on sustainable supply chain performance.

Anchored in well-established theoretical perspectives, this research contributes to the current body of knowledge by proposing the following conceptual framework:

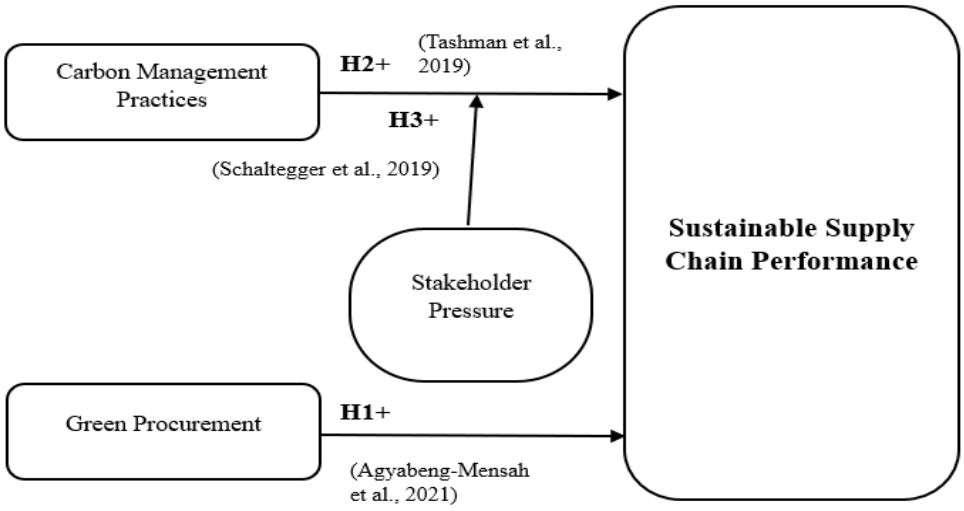


Figure 1: The Paper Conceptual Framework

3. METHODS

3.1. Sampling Strategy

This study employed a quantitative, cross-sectional design to rigorously investigate the interconnections among green procurement, carbon management practices, and sustainable supply chain performance in emerging-market settings, while also assessing how stakeholder pressure moderates these links. A quantitative method was chosen for its strength in testing hypotheses with precision and quantifying both main and interactive effects among latent variables through structured survey responses. The cross-sectional approach proved well-suited for gathering data efficiently from a wide range of supply chain participants, offering a clear, contemporary picture of sustainability practices and perceived outcomes amid the fast-changing

conditions typical of emerging economies—a choice aligned with standard practices in supply chain and sustainability scholarship (Bryman, 2016; Hair et al., 2019). To promote representativeness and incorporate varied viewpoints essential to understanding sustainable supply chain dynamics, stratified sampling was applied to balance responses across four key groups, each targeted to comprise roughly one-quarter of the sample: (1) procurement and supply chain managers who handle sourcing and logistics choices; (2) sustainability, environmental, and CSR specialists who guide carbon and green strategies; (3) operations and production managers who put low-carbon measures into practice in manufacturing and distribution; and (4) academics, consultants, and policy experts with deep insight into sustainable supply chain governance in developing contexts. This deliberate mix of managerial, operational, strategic, and expert perspectives bolstered the credibility and broader applicability of the results. Data collection relied on a carefully crafted, self-administered online questionnaire built around well-established, validated scales drawn from prior work on sustainable supply chains and environmental management, with multi-item measures adapted for green procurement (Testa et al., 2016), carbon management practices (Lee et al., 2014), sustainable supply chain performance (Dubey et al., 2019), and stakeholder pressure (Zailani et al., 2015; Tashman et al., 2019). All items used a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) to capture fine-grained assessments of practices and performance. The instrument was refined through expert review by supply chain and sustainability scholars, followed by a pilot test with industry practitioners, which prompted only slight adjustments for clarity and local relevance. Distribution occurred online via Google Forms, leveraging professional networks, industry associations, academic lists, sustainability communities, and LinkedIn groups focused on supply chain professionals in emerging economies, with particular emphasis on Southeast Asia. After careful data cleaning to remove incomplete, erratic, or patterned responses, 385 usable questionnaires remained from an original 756 submissions—a sample size well above the thresholds needed for robust multivariate analysis and moderation testing, thereby supporting reliable statistical power and model stability (Hair et al., 2019).

3.2. Data Analysis

Data analysis proceeded with SPSS version 26 and Hayes' PROCESS macro (Hayes, 2022), following a clear, step-by-step sequence to ensure thorough and trustworthy results. The process began with descriptive statistics to profile the respondents and inspect the overall shape and spread of the data. Reliability was then evaluated through Cronbach's alpha, where all constructs comfortably surpassed the conventional 0.70 cutoff, confirming solid internal consistency (Hair et al., 2019). An exploratory factor analysis, using principal component extraction and varimax rotation, came next to verify the underlying structure of the measures, with only items loading above 0.50 retained for further analysis. To test the main relationships, multiple regression models examined the direct influences of green procurement and carbon management practices on sustainable supply chain performance, while statistically accounting for potential confounders such as firm size, industry sector, and level of export activity, in keeping with recommended approaches in the sustainability literature (Shrestha, 2020). The proposed moderating effect of stakeholder pressure was then investigated through moderated regression via the PROCESS macro, which provided accurate estimates of interaction terms and allowed detailed exploration of conditional effects (Hayes, 2022). Significance was determined at the conventional $p < 0.05$ level, and simple slopes were plotted and tested to clarify how the relationships between carbon management practices and sustainable supply chain performance shifted under conditions of high versus low stakeholder pressure. Collectively, these analytical steps delivered rigorous hypothesis testing, dependable parameter estimates, and strong overall validity.

4. RESULTS

4.1. Descriptive Statistical Analysis

Table 1. Cross-Tabulation of Respondent Characteristics

Characteristic	Category	Percentage (%)
Job Position / Professional Role	Supply Chain / Procurement Manager	32%
	Operations / Production Manager	26%
	Sustainability / Environmental Manager	21%
	Senior Executive / Strategic Manager	15%
	Other (e.g., consultants, analysts)	6%
	Total	100%
Firm Size (Number of Employees)	Small enterprises (<50 employees)	18%
	Medium-sized enterprises (50–249 employees)	35%

	Large enterprises (250–999 employees)	27%
	Very large enterprises (≥1,000 employees)	20%
	Total	100%
Primary Industry Sector	Manufacturing / Industrial production	38%
	Logistics / Transportation / Warehousing	24%
	Retail / Distribution	17%
	Agriculture / Food processing	13%
	Energy / Chemicals / Materials	8%
	Total	100%
International Trade Involvement	No international trade	10%
	Low export intensity (<25%)	26%
	Moderate export intensity (25–50%)	34%
	High export intensity (>50%)	30%
	Total	100%

Source: (The authors, 2025)

Table 1 presents the demographic characteristics of the respondents. Regarding professional roles, the majority were supply chain or procurement managers (32%), followed by operations or production managers (26%) and sustainability or environmental managers (21%). In terms of firm size, medium-sized enterprises accounted for the largest proportion (35%), indicating the strong representation of SMEs in emerging markets. Manufacturing and industrial production firms dominated the sample (38%), followed by logistics and transportation companies (24%). Concerning international trade involvement, 64% of the surveyed firms reported moderate to high export intensity, reflecting the significant integration of emerging market firms into global supply chains.

4.2. Reliability analysis

Table 2: Reliability analysis of "Sustainable Supply Chain Performance".

Reliability Statistics

Cronbach's Alpha	N of Items
.767	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SSCP1	7.868	4.097	.701	.725
SSCP2	7.562	4.692	.703	.719
SSCP3	6.002	7.356	.656	.710
SSCP4	6.315	7.121	.724	.737

Source: (The authors, 2025)

Where the survey indicators labeled SSCP1 to SSCP4 corresponded directly to items 1 through 4 in the questionnaire and were explicitly designed to operationalize the latent construct of early childhood cognitive development.

As reported in Table 2, all indicators demonstrated corrected item–total correlation coefficients above the accepted threshold of 0.30, thereby confirming satisfactory item discrimination. The overall reliability of the scale was robust, with a Cronbach's alpha coefficient of 0.767, exceeding the recommended minimum criterion of 0.70 and indicating strong internal consistency (Hair et al., 2009). Notably, deleting any individual item resulted in a slight decrease in the overall alpha value, implying that each indicator made a meaningful contribution to the reliability of the scale. Furthermore, the alpha-if-item-deleted coefficients for all items consistently surpassed their respective corrected item–total correlations, providing additional evidence that each item positively enhanced the coherence of the construct measurement (Tavakol & Dennick, 2011). Accordingly, all four indicators were retained

for subsequent analyses, while similar levels of reliability were observed across the remaining measurement scales employed in this study.

4.3. Exploratory factor analysis (EFA)

Table 3: Factor Loading Matrix.

Rotated Component Matrix[a]			
Component with loading factors			
1	2	3	4
SSCP1 .716	GP1 .740	CMP1 .700	SP1 .680
SSCP2 .722	GP2 .785	CMP2 .725	SP2 .733
SSCP3 .753	GP3 .769	CMP3 .768	SP3 .726
SSCP4 .729	GP4 .699	CMP4 .732	SP4 .709
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.			
a. Rotation converged in 7 iterations.			

Source: (The authors, 2025)

Where the measurement items labeled GP1–GP4, CMP1–CMP4, and SP1–SP4 were systematically developed to operationalize the two independent constructs and the moderating variable, with each latent dimension assessed through four carefully designed indicators.

As presented in Table 3, the exploratory factor analysis (EFA) yielded a clear four-factor solution, precisely corresponding to the hypothesized dependent construct, the two explanatory constructs, and the moderator. All sixteen items exhibited factor loadings exceeding the recommended threshold of 0.50 (Hair et al., 2009), thereby demonstrating strong convergent properties and accurate construct representation. Accordingly, no items were eliminated from the measurement model, and the results provided compelling empirical support for the construct validity of all variables incorporated in the analysis.

4.4. Multiple linear regression model

Table 4: Coefficients[a].

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.317	.655		4.307	.000
	GP	.670	.744	.666	3.244	.000
	CMP	.693	.859	.688	3.461	.000

a. Dependent Variable: SSCP

Source: (The authors, 2025)

Where **SSCP**: Mean of SSCP1 - SSCP4; **GP**: Mean of GP1– GP4; **CMP**: Mean of CMP1– CMP4

As presented in Table 4, the results of the t-tests reveal that the significance levels (Sig.) associated with both tested relationships are .000, which are markedly lower than the commonly accepted threshold of 0.05. This indicates that each independent variable exerts a statistically significant effect on the dependent construct. Consequently, the empirical findings provide strong support for the acceptance of both hypothesized relationships.

4.5. Moderator analysis

Table 5: Results analysis of "Stakeholder Pressure".

Model: 1 Y: SSCP X: CMP W: SP Sample Size: 385

****

OUTCOME VARIABLE: SSCP Model Summary

R	R-sq	MSE	F	dl1	dl2	p
.693	.480	.586	5.352	3.000	381.000	.000

Model

	coeff	se	t	p	LLCI	ULCI
constant	7.299	.738	59.050	.000	7.668	7.319
CMP	.621	.759	4.362	.000	.722	.707
SP	.674	.628	4.384	.000	.755	.747
Int_1	.565	.812	4.297	.000	.758	.735

Source: (The authors, 2025)

Where SP was operationalized as the average composite score of items SP1 through SP4.

As shown in Table 5, the interaction term (Int_1) produced a highly significant p-value of 0.000, which is considerably lower than the conventional cutoff of 0.05. This finding provides clear statistical evidence of a significant moderating role of stakeholder pressure in the relationship between carbon management practices and sustainable supply chain performance. Moreover, the positive coefficient of the interaction effect (β = 0.565) suggests that higher levels of stakeholder pressure amplify the positive impact of carbon management practices on sustainable supply chain performance. Therefore, the empirical results lend strong support to the acceptance of hypothesis H3.

5. DISCUSSION

5.1. Result Summary

Green procurement and carbon management practices were both found to exert strong and statistically significant effects on sustainable supply chain performance in emerging markets, as indicated by standardized regression coefficients of 0.666 and 0.688, respectively. Furthermore, stakeholder pressure demonstrated a significant moderating role, strengthening the relationship between carbon management practices and sustainable supply chain performance, with an interaction coefficient of 0.565. Collectively, these empirical findings provide robust support for all proposed research hypotheses and offer strong validation for the conceptual framework underlying this study.

5.2. Theoretical Implications

The robust positive link between green procurement and sustainable supply chain performance provides strong backing for the natural resource-based view, which positions environmentally focused sourcing as a valuable strategic capability that delivers lasting operational and competitive advantages (Hart & Dowell, 2011; Laari et al., 2016). These results align closely with prior studies showing that green procurement boosts supplier adherence, improves resource use, and strengthens reputational assets, ultimately enhancing both environmental and operational results (Agyabeng-Mensah et al., 2021; Liu et al., 2016). That said, the findings challenge some institutional economics arguments suggesting that lax regulation and scattered supplier networks in emerging economies often turn green procurement into little more than symbolic compliance (Walker & Brammer, 2012; Zhu et al., 2013). Rather, this research indicates that companies can treat green procurement as an effective internal control tool to offset regulatory shortcomings, supporting ecological modernization theory's idea that eco-innovations can produce win-win outcomes for the environment and the bottom line (Bush & Spaargaren, 2024). At the same time, the evidence cautions against assuming automatic financial gains from green procurement, reinforcing the need to consider specific conditions and the quality of execution as highlighted by Testa et al. (2016) and Luthra et al. (2016). In sum, this study promotes a nuanced, contingency-based perspective, recognizing green procurement as a potent yet highly context-sensitive lever for advancing sustainable supply chain performance in emerging markets.

The clear and substantial positive impact of carbon management practices on sustainable supply chain performance offers compelling evidence in favor of the natural resource-based view, which highlights how forward-thinking environmental strategies create lasting strategic advantages through improved efficiency, lower risks, and enhanced corporate reputation (Hart & Dowell, 2011; Busch & Hoffmann, 2011). This aligns closely with earlier research showing that well-structured approaches—such as thorough carbon measurement, targeted emissions cuts, and active collaboration with suppliers—deliver meaningful improvements in both environmental and operational results (Lee et al., 2014; Zhu et al., 2010). At the same time, the findings push back against more pessimistic views that question the real value of carbon initiatives in emerging markets due to limited technology and tight budgets (Tashman et al., 2019). Far from producing only token or modest effects, the present study reveals that carbon management can generate considerable performance gains when thoughtfully embedded in operations, indicating that strategic commitment matters more than resource wealth alone. Yet the results also qualify overly narrow, purely cost-focused interpretations of carbon reduction (Busch & Hoffmann, 2011), lending weight instead to the perspective that ethical and ecological motivations are playing a growing role in corporate decision-making (Schaltegger & Csutora, 2012). Overall, these insights portray carbon management as a dual-purpose driver—strategic and value-driven—that effectively connects economic

priorities with ecological responsibilities, enriching our theoretical grasp of sustainability performance within emerging-market supply chains.

The notable moderating role of stakeholder pressure in strengthening the link between carbon management practices and sustainable supply chain performance offers solid empirical backing for institutional theory, which views coercive, normative, and mimetic forces as powerful drivers of organizational alignment and legitimacy-seeking behavior (DiMaggio & Powell, 1983; Tashman et al., 2019). This pattern echoes a range of earlier studies showing how intensified scrutiny from regulators, customer expectations, and investor demands can significantly boost the environmental and operational payoffs of carbon-focused efforts (Zailani et al., 2015; Kumar et al., 2021). At the same time, the evidence runs counter to claims that disjointed stakeholder signals and lax institutional oversight in emerging economies typically weaken sustainability pressures, resulting in superficial adoption or outright greenwashing (Marquis et al., 2016; Delmas & Burbano, 2011). Rather, the present findings suggest that when stakeholder demands are consistent and trustworthy, they can shift carbon management from a mere regulatory checkbox to a genuine source of strategic advantage and improved performance. That said, in line with Aguilera et al. (2018), the results also recognize that overly intense or conflicting pressures can overburden management capacity, pointing toward the possibility of diminishing or even negative returns at extreme levels. Taken together, this work enriches institutional theory by reframing stakeholder pressure not just as a prompt for initial adoption, but as an active, shaping force that determines how effectively carbon management translates into meaningful sustainable supply chain gains in emerging-market setting.

5.3. Practical Implications

The strong positive link between green procurement (GP) and sustainable supply chain performance (SSCP) carries important practical lessons for companies in emerging markets. Drawing on ecological modernization theory, the evidence urges managers to move beyond viewing GP as mere regulatory window-dressing and instead embrace it as a deliberate strategic lever for weaving sustainability goals into upstream sourcing choices (Bush & Spaargaren, 2019; Zhu et al., 2013). Practically, this means systematically incorporating environmental standards into supplier selection, contract terms, and ongoing performance tracking to extend sustainability commitments throughout the supply network (Testa et al., 2016; Walker & Brammer, 2012). Especially where formal regulation is weak, GP emerges as a valuable internal control mechanism that builds accountability, promotes transparency, and drives better resource use to fill institutional gaps (Geng et al., 2017; Liu et al., 2016). At the same time, the inconsistent financial payoffs remind managers not to count on quick cost savings; success instead depends on patient capability building, close supplier partnerships, and a willingness to invest for the longer term (Luthra et al., 2016; Laari et al., 2016).

Turning to carbon management practices (CMP), the findings highlight the importance of embedding carbon reduction efforts directly into everyday operations and logistics rather than treating them as a side responsibility in CSR departments. The clear performance gains support treating carbon accounting, energy-saving measures, and low-carbon transport redesign as core strategic priorities instead of compliance costs (Lee et al., 2014; Busch & Hoffmann, 2011). In resource-constrained emerging-market settings, firms benefit most from starting with flexible, incremental CMP approaches that fit current capabilities while steadily advancing technology adoption (Zhu et al., 2010; Tashman et al., 2019). Beyond cost considerations, the results underscore broader advantages—reputational strength, stronger stakeholder relationships, and reduced exposure to risks—that make proactive carbon governance especially worthwhile for firms facing international environmental expectations, particularly in export-driven industries (Schaltegger & Csutora, 2012; Tachizawa et al., 2015).

The substantial moderating influence of stakeholder pressure (SP) carries important implications for governance in sustainability efforts. When regulatory enforcement is robust, customer expectations are clear, and investors apply consistent scrutiny, these forces markedly strengthen the performance impact of carbon management practices (CMP), underscoring the value of aligned and credible institutional signals (DiMaggio & Powell, 1983; Zailani et al., 2015). For policymakers in emerging economies, this points to the need to bolster monitoring systems, mandate greater transparency, and enforce stricter sustainability disclosure rules so that external drivers reliably support and amplify companies' own environmental commitments (Aguilera et al., 2018; Schaltegger et al., 2019). On the managerial side, actively building relationships with influential stakeholders—multinational clients, NGOs, investors, and others—allows firms to turn what might feel like burdensome demands into opportunities for collaboration, knowledge sharing, innovation, and greater supply chain durability (Gualandris et al., 2015; Marquis et al., 2016). At the same time, leaders should remain mindful of the risks posed by contradictory or overwhelming stakeholder signals, which can lead to resource depletion, decision fatigue, or superficial responses rather than genuine progress (Delmas & Burbano, 2011; Aguilera et al., 2018). Taken together, the evidence highlights that successful sustainability governance in emerging-market contexts depends on skillfully aligning internal strengths with well-coordinated external pressures, ultimately converting sustainability demands into sources of lasting competitive strength.

5.4. Limitations

While this study makes valuable contributions, it is subject to several important limitations. Its cross-sectional approach means the findings reflect correlations at a single point in time rather than establishing clear cause-and-effect relationships or tracking how sustainability efforts and performance unfold over longer periods. Relying solely on self-reported survey responses also opens the door to common method bias and social desirability tendencies, which could lead respondents to overstate their firms' sustainability achievements. Although the sample draws from various industries, the research did not delve deeply into differences across sectors, national institutional contexts, or regulatory frameworks, which constrains the broader applicability of the results. Moreover, the analysis did not distinguish between superficial (symbolic) and genuine (substantive) sustainability actions, even though these may produce markedly different outcomes, especially under conditions of institutional weakness.

5.5. Future Research Directions

Looking ahead, future work would benefit from longitudinal designs and mixed-method approaches to better uncover the time-sensitive and causal pathways connecting green procurement, carbon management, and sustainable supply chain performance. Cross-country comparative investigations could shed light on the specific role of regulatory quality in shaping sustainability results. Researchers should also explore the internal drivers of effective implementation, such as managers' mindsets, top-level leadership support, and prevailing organizational values, as potential mediators. A closer look at the divide between symbolic gestures and substantive practices would help clarify the prevalence and consequences of greenwashing. Finally, examining how emerging digital tools—blockchain for traceability, IoT for real-time monitoring, and AI for decision support—can be woven into sustainability governance offers a rich and timely direction for enhancing transparency and accountability throughout complex global supply networks.

5.6. Conclusion

This research delivers solid empirical support showing that green procurement and carbon management practices meaningfully boost sustainable supply chain performance in emerging-market settings, with stakeholder pressure playing a pivotal role in magnifying those benefits. By thoughtfully combining insights from institutional theory and the natural resource-based view, the study develops a more balanced perspective on how outside institutional forces and internal strategic strengths interact to drive genuine sustainability results. The evidence clearly positions sustainability not as an imposed compliance cost or superficial exercise, but as a purposeful route to greater operational durability, stakeholder credibility, and sustained competitive edge. Both managers and policymakers can draw practical guidance from the need to thoughtfully coordinate procurement choices, carbon-focused strategies, and active stakeholder relationships in order to secure lasting sustainability gains. In essence, the work offers a context-aware blend of theoretical depth and actionable insight that strengthens the foundation for effective sustainable supply chain management across emerging economies.

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Sustainable Supply Chain Performance in Emerging Markets: The Influence of Green Procurement, Carbon Management, and Stakeholder Pressure

APPENDIX: Survey

Table 6. Survey Questionnaire

Background information

1. What is your current position in your organization?	Procurement / Supply Chain Manager	Operations / Production / Logistics Manager	Sustainability / Environmental / CSR Specialist	Academic / Consultant / Policy Expert	Other (Please specify): _____
2. How would you classify the size of your organization??	Small enterprise (fewer than 50 employees)	Medium-sized enterprise (50–249 employees)	Large enterprise (250–999 employees)	Very large enterprise / Multinational corporation (1,000 or more employees)	
3. Which industry best describes your organization's primary business activity??	Manufacturing / Industrial production	Logistics / Transportation / Warehousing	Retail / Distribution	Agriculture / Food processing	Other (please specify)
4. What is your organization's level of involvement in international trade or global supply chains??	No international trade involvement	Low export intensity (less than 25% of total revenue)	Moderate export intensity (25% – 50% of total revenue)	High export intensity (more than 50% of total revenue)	

No.	Variables	Coded Observed Variables	Content
1.	Sustainable Supply Chain Performance (SSCP)	SSCP1	Our supply chain effectively integrates environmental, economic, and social objectives across procurement, production, and logistics activities. (Ahi & Searcy, 2013; Touboulic & Walker, 2015
		SSCP2	Our organization's supply chain practices have significantly improved long-term operational efficiency and environmental performance. (Dubey et al., 2019; Vijayvargy et al., 2017)
		SSCP3	Our supply chain governance enhances organizational resilience, risk management, and stakeholder trust. (Dubey et al., 2019; Touboulic & Walker, 2015)
		SSCP4	Our sustainability-oriented supply chain initiatives generate lasting competitive advantages in emerging-market conditions. (Khanna & Palepu, 2010; Yakovleva et al., 2012)
2.	Green Procurement (GP)	GP1	Our organization systematically incorporates environmental criteria into supplier selection and evaluation processes. (Testa et al., 2016; Walker & Brammer, 2012)
		GP2	We prioritize sourcing materials and products that minimize environmental impacts across their entire life cycle. (Zhu et al., 2013; Daly & Farley, 2011)
		GP3	Green procurement practices in our organization enhance supplier collaboration and resource efficiency. (Laari et al., 2016; Hart & Dowell, 2011)

		GP4	Our green procurement initiatives contribute significantly to reducing waste, emissions, and environmental risks in the supply chain. (Geng et al., 2017; Agyabeng-Mensah et al., 2021)
3.	Carbon Management Practices (CMP)	CMP1	Our organization systematically measures, monitors, and reports carbon emissions throughout the supply chain. (Lee et al., 2014; Schaltegger & Csutora, 2012)
		CMP2	We actively implement energy-efficiency and low-carbon initiatives to reduce operational and logistics-related emissions. (Zhu et al., 2010; Busch & Hoffmann, 2011)
		CMP3	Carbon management practices in our organization strengthen operational efficiency and long-term sustainability performance. (Hart & Dowell, 2011; Luthra et al., 2016)
		CMP4	Our carbon reduction strategies enhance supply chain resilience and regulatory compliance. (Tashman et al., 2019; Lee et al., 2014)
4.	Stakeholder Pressure (SP)	SP1	Regulatory authorities exert strong pressure on our organization to adopt environmentally responsible supply chain practices. (DiMaggio & Powell, 1983; Tashman et al., 2019)
		SP2	Customers and international buyers strongly demand carbon reduction and sustainable supply chain practices. (Zailani et al., 2015; Tachizawa et al., 2015)
		SP3	Investors, NGOs, and communities significantly influence our organization's environmental strategies. (Aguilera et al., 2018; Schaltegger et al., 2019)
		SP4	Stakeholder expectations motivate our organization to intensify carbon management initiatives beyond regulatory compliance. (Bansal & Clelland, 2004; Marquis et al., 2016)

Survey link: https://docs.google.com/forms/d/e/1FAIpQLScT6WrFIN4OpPsBWTjHgbhTVsRR1-ph4UHQ4ZKKKbmjQ4Zreg/viewform?usp=header

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