



Attaining sustainable excellence: Investigating the impact of sustainable scm and circular economy on green garment industry in Bangladesh

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ABSTRACT

Amid global climate challenges, loss of biodiversity and resource depletion firms must act for sustainable performance (SP) and future well-being. It is crucial to understand the underlying mechanisms that enhance SP. This study aims to examine the impact of sustainable supply chain management (SSCM), and circular economy (CE), on SP in Bangladesh's green garment industry. Employing a quantitative research design, we tested the hypothesized structural model using data from 303 managers collected through surveys. The Partial Least Square Structural Equation Modeling (PLS SEM) statistical method was utilized to examine the hypotheses. The results indicate that SSCM positively impacts CE and SP, and CE mediates the SSCM-SP link. This study contributes to the literature by enhancing the Natural Resource-Based View theory, presenting SSCM-CE as resources that enhance SP. The findings hold valuable implications for Bangladesh's RMG policymaking practitioners.

1. Introduction

The manufacturing industry's environmental impact is a growing concern due to pollution and waste generation [1], posing risks to present and future generations. Therefore, it is imperative for these enterprises to acknowledge their global environmental responsibilities and embrace the commitment to protect nature and the environment [2]. This awareness has given birth to the concept of sustainable performance (SP) within firms, wherein the pursuit of social and environmental objectives is considered equally crucial to achieving financial goals [3]. Moreover, firms now find sustainability increasingly crucial due to heightened scrutiny from diverse stakeholders stemming from their interconnectedness with society [4]. In recent years, this focus on sustainability has expanded beyond individual firms to include their supply chain partners [5].

Before decades it was observed that failure to adhere to sustainability standards throughout the multi-tiered supply chain can result in negative publicity for global brands. Examples of such consequences include Mattel's loss of market share and reputation due to the recall of toys containing harmful paint obtained from their suppliers [6], as well as the battle faced by high-street apparel retailers, as their sub-tier

suppliers released harmful chemicals into significant rivers in China [7]. In 2011, the parent company of Zara was charged by the Brazilian government for alleged "sweatshop-like working conditions" in a sub-contractor's facilities, which belonged to Zara's main supplier, AHA [8]. Similarly, Nestlé adjusted its palm oil sourcing in 2010 due to illegal deforestation carried out by an Indonesian sub-tier supplier [9]. These examples fall under the concept, known as the "chain liability effect," [10] indicating that the focal firm is responsible for actions occurring within their global supply chains [11].

The degree of reliance on supply chain partners affects a firm's sustainability efforts. Sustainable supply chain management (SSCM) has received much attention [12] and it emerged as firms manage sustainability practices within supply chains to attain sustainable goals [13]. Moreover, as stakeholders' pressures lead firms to prioritize economic, environmental, and social performance [14], many firms prioritize environmental protection and transition to a circular economy (CE) in pursuit of sustainability achievement [15]. The concept of CE involves redefining the traditional "end-of-life" concept and instead prioritizing renewable energy sources and incorporating measures to diminish, reuse, recycle, and recover materials across production, distribution, and consumption processes [16]. The ultimate objective of this approach

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is to attain sustainable development, encompassing environmental well-being, economic prosperity, and social equity, benefiting current and future generations [17].

The concept of CE in supply chain management (SCM) has attracted considerable interest from researchers [18,19]. An increasing focus on incorporating sustainable management, including SSCM, to facilitate the transition toward CE [20]. While firms prioritize sustainability within their own operations, the interplay between suppliers' and their own sustainability practices in achieving sustainable performance (SP) remains unclear in the literature. Therefore, a deeper understanding of how firms integrate sustainable practices across the supply chain in the form of SSCM and internal CE practices is essential.

This study investigates the role of a firm's SSCM in driving the adoption of CE practices to achieve SP. We explore the direct impact of SSCM on SP and its indirect effect through the mediating role of CE practices. Two research questions are addressed: 1) To what extent does SSCM and CE influence a firm's SP? 2) Does CE practices mediate the relationship between SSCM and SP? A conceptual model connecting SSCM, CE practices, and SP is developed and tested using a sample of 150 green textile firms from Bangladesh, an emerging economy facing environmental challenges. Environmental problems are particularly distressing many emerging economies now [21]. The significant roles of the textile and garment sector in Bangladesh and its commitment to the UN's Sustainable Development Goals make it a relevant case study for understanding sustainability practices in the industry [22].

The current study contributes the literature by offering the combined effect of SSCM and CE on SP. The integration of SSCM and CE practices is portrayed as a strategy for cultivating strategic assets and specific skills essential for achieving economic. Besides that, it also contributes to the natural-resource-based view (NRBV) theory by Hart [23] that has been employed in recent studies on sustainability challenges [24–27]. This theory advocates for further research on emerging capabilities within firms that lead to sustained competitive advantage, emphasizing areas such as pollution prevention, product stewardship, and sustainable development strategies. Empirical evidence from this study reveals that SSCM and CE practices significantly predict SP, highlighting their crucial role as fundamental resources and competencies for firms in implementing pollution prevention, product stewardship, and sustainable development strategies. As such, the direct and indirect (mediating) relationships between SSCM and CE on SP make a substantial contribution to the existing NRBV theory, reinforcing the theory's proposition that these practices are integral for firms striving towards sustainability.

The organization of this paper is as follows. In Section 2, we present the underlying theory, review pertinent literature, develop the theoretical framework and establish the hypotheses. In Section 3, we introduce the sample and provide definitions for the variables used to assess our hypotheses. Section 4 presents descriptive statistics and empirical findings. Section 5 encompasses the discussion and conclusions. Finally, In Section 6, potential directions for future research are outlined.

2. Literature review and hypotheses development

The subsequent sections offer an overview of the underpinning theoretical background for the research framework, including the operational definitions of SSCM, CE, and SP. Additionally, this section covers the process of hypotheses development.

2.1. Natural resource-based view of the firm

The Natural Resource-Based View (NRBV) theory extends the traditional Resource-Based View (RBV) by emphasizing firms' influence of the natural environment through resource and capability development [23]. It highlights the significance of sustainable and responsible natural resource use for competitive advantage and long-term success. NRBV offers a framework for integrating environmental considerations into strategic decisions, fostering sustainable advantage and positive

societal/environmental contributions. NRBV, renowned in academia, particularly for sustainable operations [27–30], proposes three interrelated strategies: pollution prevention, product stewardship, and sustainable development [23]. Pollution prevention minimizes waste, designs eco-friendly products, and ensures growth with environmental mindfulness. Product stewardship adds eco-friendly elements to products/processes, reducing hazardous material use [31]. Sustainable development aims to harmonize economic growth with ecological and social well-being. It encourages businesses to incorporate environmental and social factors into their decision-making processes [23].

SSCM and CE advocate aligned sustainable practices [32,33]. CE emphasizes eco-friendly resources and capabilities, aiming to eliminate waste, optimize resources, and promote recycling [24,34]. Integrating CE develops valuable scarce resources, yielding competitive advantage and SP [35,36]. CE integrates economic, environmental, and social factors for enhanced sustainability [37] and an economic system for sustainable development [38]. CE serves NRBV's strategic capacities [27], a unique asset for success. NRBV research connects environmental sustainability in supply chains to improve SP [39,40]. Firms leverage natural resource-based capabilities in green SCM for sustainable practices [40,41] throughout sourcing, production, transportation, and waste management. NRBV might frame SSCM and CE's individual impact on SP. However, there is a noticeable gap in the existing literature, with very few studies highlighting the mediating effect of CE between SSCM and SP within this theoretical context. The individual impact is acknowledged, but the integration, especially concerning SP achievement, remains insufficient. Establishing a clear relationship between sustainable practices and performance is essential, viewing SSCM and CE as unique and indispensable strategies for enhancing firms' SP. In response to this gap, our study proposes an extension of the NRBV theory by integrating SSCM and CE practices. This integration is crucial to address the theory's requirement for emerging capabilities that lead to sustained competitive advantage. Thus, our study aims to fill these theoretical gaps by exploring the interplay between SSCM, CE, and SP, thereby advancing the NRBV framework.

2.2. Sustainable supply chain management (SSCM)

SSCM is essential for sustainable supply chain integration, spanning sourcing to disposal, to mitigate negative environmental, social, and economic impacts [42,43]. It emphasizes long-term stakeholder value through collaborative supply chain efforts [44], driven by stakeholder pressure, resource scarcity, cost savings, and competitive edge [45]. SSCM enables meeting customer demands, resource reduction, efficiency, environmental impact mitigation, differentiation, and success [46], aligning with sustainability imperatives.

In Bangladesh's textile industry, SSCM enhances environmental, social, and financial performance [47]. Mitigating pollution, energy use, and waste through practices like sustainable sourcing, waste reduction, and energy efficiency is key. Socially inclusive practices, like fair labor and safety, enhance social outcomes and reputation [48]. SSCM also cuts costs and boosts efficiency, reducing energy and waste expenses [49]. It bolsters customer loyalty and brand value with socially and environmentally conscious products. SSCM drives Bangladesh's textile industry's sustainable development by enhancing environmental, social, and financial aspects [22], navigating sustainability challenges and fostering competitiveness for a sustainable future.

2.3. Circular economy (CE)

CE is a developing concept with the goal of revolutionizing linear economic models by promoting closed-loop systems that regenerate and reuse materials [50]. It minimizes waste, improves resource efficiency, and offers environmental and economic benefits [51]. This concept has gained considerable attention in recent years, as businesses and policymakers seek to address the challenges of resource depletion and

environmental degradation. Through longevity design, closed-loop recycling, and waste reduction, the industry can reduce its environmental footprint and support the country's economic progress.

The textile industry, known for its resource-intensive nature, can greatly benefit from CE principles [52]. By adopting strategies like longevity design, closed-loop recycling, and waste reduction, the industry can mitigate its environmental impact and unlock economic opportunities [53]. Bangladesh's textile industry, a major global exporter, faces environmental and social challenges such as pollution and poor working conditions [54]. To ensure long-term viability, sustainable practices like CE principles are crucial [55]. Embracing circularity in Bangladesh's textile industry has the potential to tackle environmental and social challenges while creating economic opportunities.

2.4. Sustainable performance (SP)

SP entails attaining sustainability across economic, environmental, and social aspects, commonly referred to as the triple bottom line (TBL) [43]. It recognizes the interdependence between financial success, planet well-being, and societal impact. Firms must adopt sustainable practices, reduce emissions and waste, conserve resources, promote social responsibility, and ensure economic viability. In Bangladesh's textile industry, sustainable development is crucial since the industry's reputation is hampered due to lack of environmental degradation, poor labor and social responsibilities and natural resource depletion [56].

SSCM and CE are crucial for long-term viability and minimizing environmental and social impacts [57,58]. Despite being an economic driver, the industry faces criticism for unsustainable practices. To address these concerns, adopting sustainable practices, including CE principles, is essential [59]. This approach can improve performance by balancing economic, social, and environmental considerations. By implementing SSCM and CE principles, the textile industry in Bangladesh can achieve economic, environmental, and social sustainability, ensuring its long-term viability while minimizing negative impacts.

2.5. Research framework

Fig. 1 depicts the research framework connecting SSCM practices, CE, and SP. The framework suggests reciprocal positive influences between SSCM practices and CE, CE and SP, and SSCM practices and SP. Additionally, it includes CE as a mediator in the SSCM practices and SP relationship.

SSCM practices include environmental management (EMP), operations (OP), supply chain integration (SCI), socially inclusive practices for

employees (SIPC), and socially inclusive practices for the community (SIPC), vital for sustainability. SP is assessed through environmental (EnP), financial (FP), and social dimensions (SOP). EnP addresses resource conservation, pollution prevention, and carbon footprint reduction. FP evaluates profitability, revenue growth, and cost reduction. SOP considers employee welfare, community development, and ethical practices. CE is gauged by a unidimensional construct measuring practices like closed-loop supply chains, recycling, and waste reduction, crucial for textile industry sustainability. The research framework comprehensively connects SSCM practices, CE, and SP, with varied dimensions enhancing understanding of their intricate relationships.

2.6. Hypotheses development process

Following subsections discusses the justifications of hypotheses.

2.6.1. SSCM and CE

An increasing body of literature substantiates the favorable correlation between SSCM practices and the CE. For example, a study by Burke et al. [60] revealed that SSCM practices, such as eco-design and green sourcing, notably contribute to implementing CE principles in supply chains. Likewise, research by Le et al. [61] found that SSCM practices, including waste reduction, energy efficiency, and green logistics, can help to promote the CE by reducing waste and improving resource efficiency. SSCM practices can also facilitate the implementation of CE principles by promoting collaboration and innovation throughout the supply chain.

As an example, a study by Khan et al. [62] found that SSCM practices, including supplier collaboration, eco-design, and closed-loop supply chains, contribute to establishing a more sustainable and circular supply chain. Through collaboration with suppliers and stakeholders, firms can identify chances to minimize waste and enhance resource efficiency across the supply chain. In short, the evidence suggests that SSCM practices exert a beneficial influence on the CE. By integrating sustainability principles into SCM practices, firms can reduce waste, improve resource efficiency, and promote collaboration and innovation across the supply chain. As such, it is reasonable to hypothesize that:

Hypothesis 1: SSCM practices positively impact CE of firms in the textile industry of Bangladesh.

2.6.2. Circular economy and sustainable performance

Several studies confirm a positive CE-SP relationship across industries. For instance, Jabbour et al. [63] highlighted CE's impact on environmental and social performance in construction. Manavalan and Sultan [64] demonstrated CE's role in fostering circular supply chains.

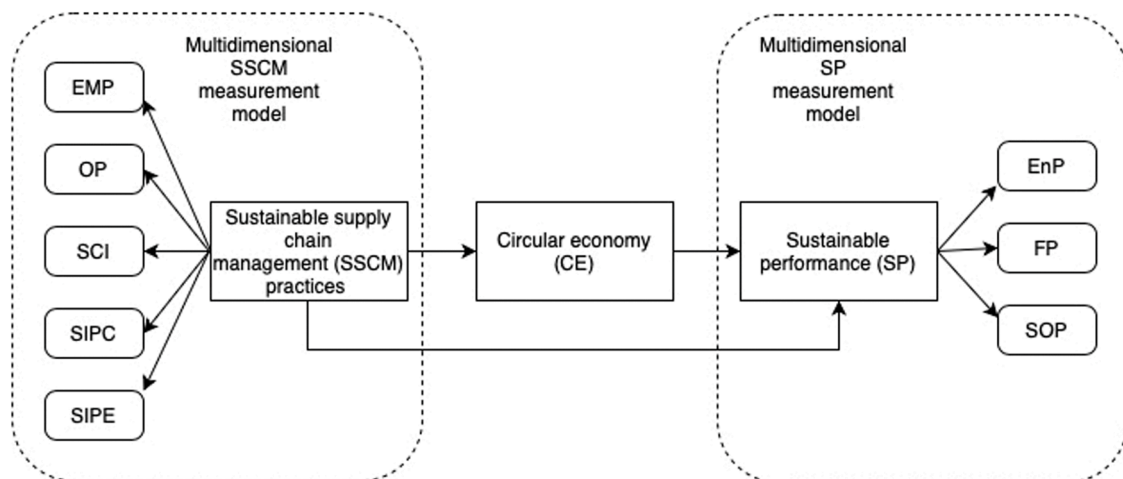


Fig. 1. Research framework.

Colucci and Vecchi [65] linked CE practices like product extension and remanufacturing to textile industry revenue/cost benefits. CE practices enhance SP by reducing waste, resource efficiency, and fostering innovation. Chowdhury et al. [66] showed CE's waste reduction and resource efficiency in smart waste management. Saha et al. [67] revealed CE's positive impact on environmental and social aspects in textiles. Akter et al. [68] proposed a CE-driven waste management model for Bangladesh's textile sector. The evidence suggests CE's positive SP impact in Bangladesh's textile industry, enhancing economic, environmental, and social sustainability. Thus, it's reasonable to hypothesize:

Hypothesis 2: CE positively impacts SP of firms in the textile industry of Bangladesh.

2.6.3. SSCM and sustainable performance

Multiple studies highlight SSCM's positive SP impact across industries. For example, Agyabeng-Mensah et al. [69] linked SSCM to reduced environmental impact, enhanced image, and financial gains. Trivellas et al. [70] showed SSCM's benefits in the food industry. In Bangladesh's textile context, SSCM enhances transparency, waste reduction, social responsibility, and financial performance. Aityassinea et al. [71] found SSCM practices like supplier selection and green procurement improve textile firms' environmental and social performance. Riva et al. [72] found green SCM's positive relation with SP in Bangladesh's garment firms. Yang and Wang [73] linked SSCM to financial gains and competitiveness in textiles. Overall, SSCM practices can positively impact SP in Bangladesh's textile sector by enhancing transparency, reducing waste, promoting social responsibility, and improving financial performance, fostering economic, environmental, and social sustainability. Thus, it's reasonable to hypothesize:

Hypothesis 3: SSCM practices positively impact SP of firms in the textile industry of Bangladesh.

2.6.4. The mediating effect of CE

CE can complement SSCM practices to achieve SP goals by reducing waste, improving resource efficiency, and promoting closed-loop supply chain practices. While SSCM already prioritizes waste reduction, CE goes further by transforming waste into valuable by-products through innovative approaches [74,75]. SSCM encourages resource efficiency, cost savings, stakeholder engagement, and innovation, while CE primarily focuses on optimizing resource use, waste reduction, and promoting recycling and material reuse to close the production and consumption loop. Consequently, CE serves as a vital mediator between SSCM and SP, synergistically integrating their efforts to create a more sustainable industry.

In the literature, CE practices have been found to be a significant mediator between big data analytics capability and sustainable performance by Riggs et al., [76]. Samadhiya et al., [27] also found CE as significant mediator between total productive maintenance, Industry 4.0 and sustainable performance. Karmaker et al., [77] studied how CE acts as a mediator in the relationship between Industry 4.0 technologies and sustainable supply chain performance within the context of emerging economies. Therefore, it can be hypothesized that:

Hypothesis 4: CE practices mediate the relationship between SSCM practices and SP of firms in the textile industry of Bangladesh.

3. Methodology

This study employed a cross-sectional research design, utilizing a structured questionnaire to gather data during the period of January to February 2022. Data were collected from a sample of employees holding managerial positions in various departments of LEED certified RMG organizations in Bangladesh. The possession of LEED certifications signifies that the apparel industry of the nation functions in adherence to regulations concerning labor welfare, water and energy conservation, and environmental safety [78]. Since this study focused on sustainable

business operations to achieve excellence in sustainable performances, LEED certified organizations were purposefully selected to get a comprehensive knowledge about the said purposes. In Bangladesh, there were a total of 200 organizations in the RMG sector that were certified by LEED, a globally-known US based green building certification system. These LEED organizations were classified into three categories: 73 in platinum, 113 in gold, and 10 in silver and rest four are general certified organization. Initially the researchers communicated to all 200 organizations through mail to conduct the research and received the response from 40 different LEED category organizations. In this stage the formal email requests were sent to the HR department of these firms, outlining project details and respondent selection criteria. Participants received a Google Form via email for data collection, preceded by advanced notification. A soft reminder was given to prompt questionnaire completion. Google Forms' popularity for remote, efficient data collection was leveraged following prior research [79].

The survey included specific selection criteria to ensure that all respondents met the following requirements: (1) they held managerial positions in LEED certified RMG organizations, (2) they had a minimum of two years of experience in the same organization, (3) they were members of the operations team in a full-time or permanent capacity, and (4) they possessed knowledge about green issues. The researchers distributed 500 questionnaires equally to all 40 respondent organizations. Out of 500 distributed questionnaires, 318 responses were received, with 15 exclusions due to criterion mismatch. Thus, 303 eligible participants resulted, yielding a 60.6 % response rate. This is deemed acceptable, surpassing the 45.6 % rate by Rubel et al. [80] in the RMG industry.

4. Data analysis and results

For measurement and structural models assessment, Smart PLS 4.0 was deliberately chosen. This technique doesn't necessitate strict adherence to a normal distribution in survey data [81]). Given our complex model, including higher-order SSCM practices and SP with mediation analysis, regression in SPSS was insufficient [82]. Thus, we used Partial Least Squares Structural Equation Modeling (PLS-SEM) for comprehensive and robust analysis.

4.1. Measures

This study assessed SSCM using Das' [13] measures: environmental management (6 items), operation practices (5 items), supply chain integration (4 items), socially inclusive practices for employees (5 items), and socially inclusive practices for the community (3 items). Circular economy employed Obeidat et al.'s [15] unidimensional "circular economy scale" (9 items), with alpha values 0.789 to 0.913. SP dimensions (economic, environmental, and social) were measured using 4 items each, adapted from Obeidat et al. [15]. Cronbach alphas for SP ranged from 0.805 to 0.910.

4.2. Common method variance

Addressing Common Method Variance (CMV) is crucial in self-report measurements. This study applied Podsakoff et al.'s [83] methodological separation and conducted a Harman single-factor assessment. Harman's assessment revealed 39.06 % variance explained by the first factor, suggesting CMV insignificance. Fischer and Fick's [84] recommendation was followed, incorporating measured and unmeasured latent method factors. R2 was maintained at a 10 % baseline using exploratory factor analysis (EFA) scores for endogenous variable's unmeasured marker variable scores [85] (see Table 1). Hence, CMV wasn't problematic in this investigation.

Table 1
Common method variance (Marker Variable).

Latent Variable	Original R-Square	Measured Marker	Unmeasured Marker
Circular Economy Practices	0.662	0.589	0.601
Sustainable Performance	0.666	0.603	0.619

4.3. SSCM and SP are higher-order reflective model

This study used a combination of 22 items for five first-order reflective dimensions and 14 items for three dimensions to explain second-order SSCM and SP constructs. Following Wetzels et al.'s [86] recommendation, first-order variable relationships were examined for second-order model validation. All first-order constructs showed significant connections, with SSCM and SP dimensions significantly related at $p < 0.01$. AVE and CR values for both SSCM and SP were significantly different (Table 2).

4.4. Measurement model

Convergent and discriminant validity were employed to evaluate the measurement model in this study. Convergent validity focuses on assessing the similarity among items that represent the same concept [81]. To evaluate convergent validity, factor loadings, AVE and CR are commonly used measures, as recommended by Hair et al. [81]. The values obtained for these measures in the present study were all higher than the designated cut-off values, as presented in Table 3 below. This indicates that the measurement model demonstrates sufficient convergent validity.

Discriminant validity in this study was assessed through two approaches: the Fornell-Larcker criteria and the Heterotrait-Monotrait ratio (Table 4a and 4b). According to the Fornell-Larcker criteria, discriminant validity is established when the square root of the average variance extracted (AVE) for each construct (diagonal values) exceeds the correlations between constructs (off-diagonal values) [87]. Additionally, the Heterotrait-Monotrait ratio, which offers a more accurate assessment, employed two distinct threshold values of 0.85 and 0.90 [88] and all the values found lower than the suggested one. As a result, the measurement model demonstrated acceptable levels of both convergent validity and discriminant validity.

4.5. Structural model

Assessing the goodness-of-fit for the structural model includes examining several measures, such as the coefficient of determination (R^2), the significance of the path coefficient b , effect size (f^2), and cross-validated redundancy (Q^2) (Hair et al., 2017). The interpretation of R^2 values is guided by the intervals proposed by Cohen [89]: values between 0.02 and 0.12 indicate a weak, values between 0.13 and 0.25 moderate and values of 0.26 and above indicate a substantial relationship.

In the current research, a structural model was established, where SSCM served as the exogenous variable influencing both CE and SP,

which acted as the mediating and endogenous variables, respectively (Table 5 and Fig. 2). Based on the findings, SP was substantially explained (66.6 %) by both SSCM and CE. On the other hand, CE the mediating variable was also substantially explained (66.2 %) by SSCM. Hence, R^2 was deemed significantly acceptable based on the criteria proposed by Cohen (1988). As shown in Table 5, the three direct paths were also notably positive: SSCM to SP (β 5 0.376, $p < 0.01$), and SSCM to CE (β 5 0.814, $p < 0.01$) and CE to SP (β 5 0.480, $p < 0.01$). Hence, the outcomes proved all the direct hypotheses posited in this research.

Moreover, the mediation effect of CE between SSCM and SP was examined following the guidelines outlined by Preacher and Hayes [90]. According to them, if the confidence interval does not include 0, it indicates a significant mediation effect. In this study, the mediating effect of CE was observed to be significant and positive, registering a value of $\beta = 0.391$ ($p < 0.01$). Furthermore, the bias-corrected 95 % confidence intervals did not include 0, confirming the significance of the mediation effect. Additionally, the predictive relevance of the model was assessed using the blindfolding procedure, employing a distance of 7. According to Hair et al. (2017), a model demonstrates predictive relevance for particular endogenous constructs when the Q^2 value surpasses 0. In this investigation, the Q^2 values were 0.108 for CE and 0.106 for SSCM. Therefore, the Q^2 value indicates that the model demonstrated acceptable predictive relevance.

5. Discussions

This study examines the impact of SSCM on sustainable performance directly and indirectly through CE. First, the findings demonstrate that SSCM has a good impact on sustainable performance and serves as a critical facilitator to support organizational performance toward the environment. CE is also significantly impacted by SSCM. In addition, it is discovered that CE and organizations environmental performance have important ties. These results lend credence to initiatives like environmental management practices, operational performance, supply chain integration, socially inclusive practice for community, socially inclusive practice for employee to encourage organizations CE practices which may lead to organizational environmental concern and respect. These findings add to the understanding of the recent studies on the relationship between SSCM and sustainable performance [91]; SCM and CE practices (); and CE and sustainable performance [92].

Second, SSCM indirectly predicts sustainable performance through CE. This study finds a positive link between SSCM and organizational sustainable performance through CE in the LEED certified garment organizations. This finding proves that the CE is the underlying mechanisms through which SSCM affects organizational sustainable performances. Mediating effect of CE is also identified by earlier researchers for instance Riggs et al. [76] proved the significant positive mediating effect of CE between big data analytics capability and sustainable performance. CE mediated the relation between industry 4.0 technologies and sustainable supply chain performances [77]. The readiness of SSCM signals that practicing environmental friendly supply chain management would eventually help the organizations to align their environment friendly activities through reusing, redesigning, recycling and waste reduction in the organizational operations. Hence, adopting and practicing SSCM is anticipated to promote organizational friendliness towards the environment in the form of CE practices, which

Table 2
Output of higher-order SSCM and SP.

SSCM (AVE= 0.586, CR= 0.876)					Sustainable Performance (AVE= 0.788, CR= 0.918)		
EMP	OP	SCI	SIPC	SIPE	EnP	FP	SOP
$R^2 = 0.414$	$R^2 = 0.610$	$R^2 = 0.820$	$R^2 = 0.592$	$R^2 = 0.644$	$R^2 = 0.799$	$R^2 = 0.769$	$R^2 = 0.795$
$\beta = 0.643$	$\beta = 0.781$	$\beta = 0.672$	$\beta = 0.759$	$\beta = 0.803$	$\beta = 0.894$	$\beta = 0.887$	$\beta = 0.892$
$P < 0.01$	$P < 0.01$	$P < 0.01$	$P < 0.01$	$P < 0.01$	$P < 0.01$	$P < 0.01$	$P < 0.01$

Table 3

The result of convergent validity.

Constructs	Items	Loadings	CA	Rho_A	CR	AVE	VIF
Circular Economy	CE 1	0.775	0.904	0.906	0.922	0.567	2.18
	CE 2	0.704					1.97
	CE 3	0.722					2.11
	CE 4	0.777					2.28
	CE 5	0.797					2.40
	CE 6	0.776					2.20
	CE 7	0.703					1.93
	CE 8	0.786					2.04
	CE 9	0.731					2.14
Environmental Management Practices	EMP 1	0.795	0.872	0.879	0.903	0.609	2.46
	EMP 2	0.839					2.79
	EMP 3	0.747					1.77
	EMP 4	0.775					1.89
	EMP 5	0.772					2.16
	EMP 6	0.75					2.04
Environmental Performance	EnP1	0.821	0.856	0.857	0.902	0.698	1.87
	EnP2	0.869					2.49
	EnP3	0.813					1.84
	EnP4	0.838					2.02
Financial Performance	FP1	0.884	0.915	0.915	0.94	0.797	2.79
	FP2	0.890					2.93
	FP3	0.910					3.45
	FP4	0.886					2.92
Operational Performance	OP 1	0.581	0.674	0.719	0.801	0.51	1.21
	OP 2	0.827					1.78
	OP 3	0.824					1.78
	OP 5	0.581					1.20
Supply Chain Integration	SCI 1	0.804	0.883	0.884	0.92	0.742	1.81
	SCI 2	0.894					2.80
	SCI 3	0.876					2.64
	SCI 4	0.868					2.43
Socially Inclusive Practices for Community	SIPC 1	0.844	0.853	0.855	0.911	0.773	1.81
	SIPC 2	0.915					2.71
	SIPC 3	0.877					2.31
Socially Inclusive Practices for Employee	SIPE 1	0.695	0.826	0.83	0.878	0.591	1.50
	SIPE 2	0.784					1.89
	SIPE 3	0.82					2.01
	SIPE 4	0.754					1.67
	SIPE 5	0.786					1.83
Social Performance	SOP1	0.805	0.857	0.857	0.903	0.699	1.78
	SOP2	0.852					2.09
	SOP3	0.838					2.15
	SOP4	0.851					2.18

Table 4a

Output of Heterotrait-Monotrait ratio.

	CE	EMP	EnP	FP	OP	SCI	SIPC	SIPE	SOP
CE									
EMP	0.451								
EnP	0.801	0.438							
FP	0.681	0.344	0.743						
OP	0.846	0.578	0.722	0.454					
SCI	0.801	0.304	0.798	0.663	0.756				
SIPC	0.747	0.364	0.700	0.657	0.625	0.748			
SIPE	0.736	0.530	0.716	0.506	0.695	0.617	0.589		
SOP	0.788	0.376	0.847	0.744	0.668	0.722	0.661	0.632	

is more likely to impact organizational positive performances to the environment.

5.1. Theoretical implications

This research contributes to our comprehension of how SSCM practices in emerging economies bolster sustainable performance (SP) through circular economy (CE) initiatives. Notably, empirical evidence is drawn from green garments firms that hold LEED certification, showcasing their integration of sustainable business practices. Despite the importance of these connections, a scarcity of studies exists on the intersection of SSCM, CE, and SP. As a result, this study stands as a

significant and valuable addition to the body of sustainability literature. Uniquely, it represents the sole research focusing on the interconnectedness of SSCM, CE, and SP. Furthermore, this study pioneers an exploration into how CE acts as a mediating factor in strengthening the association between SSCM and SP. In summary, the findings of this study underscore a positive and favorable correlation between SSCM and SP facilitated by CE.

The finding demonstrates SSCM's positive impact on SP, even in a developing economy, aligning with prior studies [69,71,70]. Positive SSCM-CE relation matches prior findings [60,61], showing SSCM-associated enterprises embrace CE. The study confirms CE-SP positive link as well [63,67]. Additionally, the mediating effect of CE

Table 4b
Output of Fornell-Larcker criterion.

	CE	EMP	EnP	FP	OP	SCI	SIPC	SIPE	SOP
CE	0.753								
EMP	0.405	0.780							
EnP	0.707	0.385	0.836						
FP	0.622	0.314	0.658	0.893					
OP	0.687	0.422	0.570	0.383	0.714				
SCI	0.719	0.275	0.694	0.596	0.619	0.861			
SIPC	0.656	0.32	0.598	0.580	0.502	0.649	0.879		
SIPE	0.642	0.459	0.606	0.440	0.528	0.531	0.497	0.769	
SOP	0.698	0.334	0.727	0.660	0.525	0.626	0.565	0.534	0.836

Note: CE =Circular economy, EMP = Environmental management practices, EnP= Environmental performance, FP= Financial performance, OP=Operational performance, SCI=Supply chain integration, SIPC = Socially inclusive practice for community, SIPE= Socially inclusive practice for employee and SOP= Social performance.

Table 5
Output of Structural Model (Direct and Mediating Paths).

Direct Path								
Hypotheses	Std. Beta	Std. Error	t. Value	f^2	P values	95 % LL	95 % UL	Decision
SSCMP > SP	0.376	0.063	5.96**	0.143	0.00	0.249	0.499	S
SSCMP > CE	0.814	0.019	41.92**	1.962	0.00	0.773	0.851	S
CE > SP	0.480	0.062	7.8**	0.233	0.00	0.361	0.599	S
Mediation Hypothesis								
Hypothesis	Std. Beta	Std. Error	t. Value	f^2	P values	95 % LL	95 % UL	Decision
SSCMP > CE > SP	0.391	0.053	7.4**	–	0	0.29	0.497	S

** $p < 0.01$, (based on one-tailed test with 1, 000 bootstrapped replications); S = Supported.

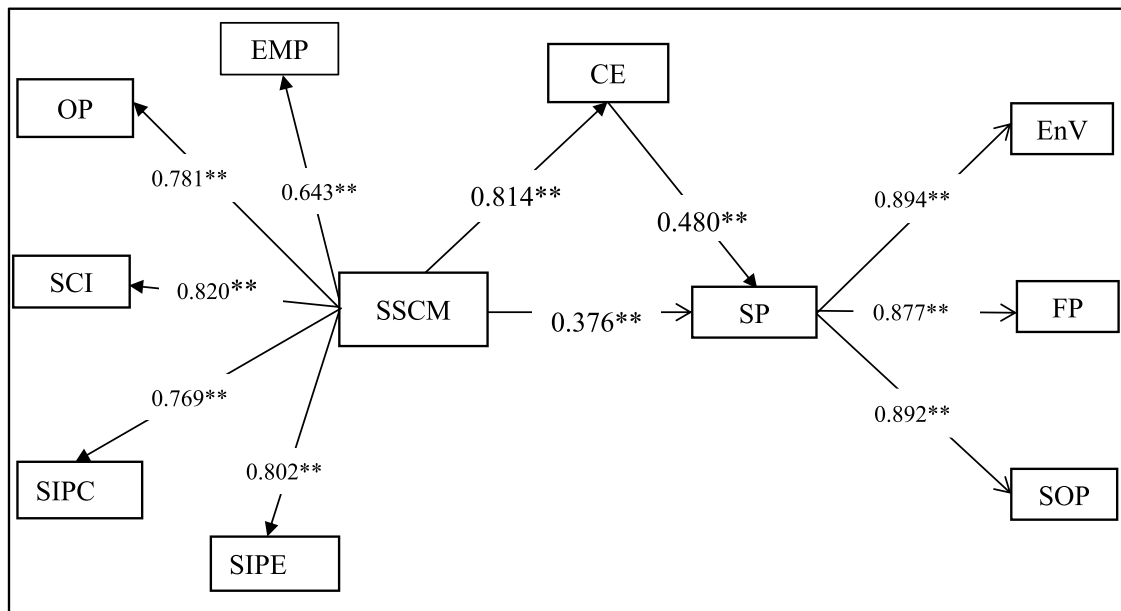


Fig. 2. Graphical presentation of the structural model result

Note: CE =Circular economy, EMP = Environmental management practices, EnP= Environmental performance, FP= Financial performance, OP=Operational performance, SCI=Supply chain integration, SIPC= Socially inclusive practice for community, SIPE= Socially inclusive practice for employee and SOP= Social performance.

between SSCM and SP corroborates previous research [27,76]. The implications of this research hold substantial importance for both theoretical understanding and practical applications. The study advances SSCM, CE, and SP literature, highlighting their interconnectedness and integration importance.

The findings also significant for NRBV theory. First, the study provides evidences how SSCM and CE practices can serve as distinct

resources for firms to enhance SP. It highlights importance of firms' efficient management of natural resources throughout the supply chain [60]. Secondly, the study establishes that CE practices positively impact SP by highlighting the enhancement of firms' capabilities to protect and promote natural resources [23]. Thirdly, the study demonstrates that CE practices mediates relationships between SSCM practices and CE practices, emphasizing the integration of CE practices to fully leverage

natural resource-based capabilities [93]. Additionally, the study offers a framework for examining the connection among SSCM, CE, and SP that highlights the importance of adopting a holistic approach to sustainability, where firms integrate SSCM and CE practices to achieve SP goals [94]. Thus, this study strengthens NRBV theory by emphasizing the importance of firms' access to and effective management of natural resources to enhance their long-term sustainability.

Moreover, the findings underscore the importance of integrating sustainable practices throughout the entire supply chain, emphasizing the incorporation of CE principles as integral components of a comprehensive sustainability strategy, and thus enriching the literature on SSCM and CE. These two critical sustainability components at work setting are better understood from the managerial perspectives working in the green garment manufacturing industry operating in a South Asian emerging economy, Bangladesh. This research could be considered as one of the pioneering efforts to examine the relationship among SSCM, CE and SP in Bangladesh's green RMG organizations. Accordingly, a new knowledge domain has evolved relating to the present study variables. Moreover, the study highlights the critical role played by emerging economy's firms' natural resource-based capabilities in achieving SP.

5.2. Managerial implications

The study stresses the importance of adopting SSCM practices as such firms could make supplier selection based on sustainability criteria. Managers in the textile industry can implement these practices to encourage their suppliers to be sustainable and reduce their own and suppliers' environmental impact and enhance economic and social sustainability performance. Moreover, the study emphasizes the positive impact of CE practices such as internal closed-loop operational practices, product redesign, and resource efficiency on SP. Textile managers can apply these practices to improve their overall SP. Drawing upon the identification of SSCM and CE practices, different other manufacturing units (printing, packaging, washing, embroidery) of the textile industry could be more informed in taking strategies to maximize their sustainability performances.

The study confirms that CE practices mediate the connection between SSCM and SP. Textile managers can integrate CE practices with SSCM practices to enhance their sustainability goals. For instance, managers can adopt processes such as using recycled materials in the production process and incorporating waste reduction strategies in operations to achieve resource utilization, cost reduction and overall wellbeing. Moreover, the sustainability strategy (SSCM and CE) led model might provide the manufacturing sectors and their relevant stakeholders with more inclusive evidence to categorize crucial strategies for SP and to apply them in various sectors, such as automobile, construction and agriculture to attain strategic advantages. This sustainability study may provide policymakers with research-based answers for the environmental problems faced by other manufacturing sectors.

Last but not least, this research offers textile firms a new insight into the concept of SSCM and CE as enablers of corporate environmentalism and the greening of manufacturing in the textile industry. The study specifically focuses on the sustainable performance of LEED certified garment firms. Moving beyond conventional metrics such as GDP and export earnings, it is crucial to evaluate the sector's dedication to sustainability across all aspects of its operations. In this pursuit, this study could be a great help for the policymakers of the green garment firms. Ultimately, the study findings could be a great help for the textile sector to achieve SDGs of Bangladesh Government. Sustainable policymakers should comprehend that when firms undergo SSCM and CE in action, firms could achieve SP in aligned with SDGs of Bangladesh Government.

6. Conclusion

This study highlights the importance of urgent need for firms to pay

attention to the global challenges including global climate change, biodiversity loss, and resource depletion to achieve SP for the well-being of current and future generations. Our findings demonstrate a favorable influence of SSCM on both CE and SP. Besides that, we found a significant mediating impact of CE between SSCM and SP, highlighting CE's role in connecting them and enhancing firms' sustainable performance. This study enriches NRBV theory by highlighting how SSCM and CE practices can align with theory's suggestions on responsible use of natural resources of firms. The findings extend understanding of how SSCM and CE synergize to boost SP, advancing NRBV theory. The study's notable contribution lies in establishing the relationships among SSCM, CE and SP through examination of LEED-certified green garment firms in emerging economies.

This study offers significant insights to practitioners in Bangladesh's ready-made garment (RMG) industry, country's top foreign currency earner through exports. They can adopt and promote SSCM and CE for supporting the industry's sustainable growth and enhance its global competitiveness. The limitations of this study involve its concentration on a specific industry case, namely the green garment sector in an emerging country context, and the use of cross-sectional data. Exploring other industries and country contexts, along with employing experimental and longitudinal data, future research could yield additional insights that further enrich our understanding of the relationships studied. Moreover, considering various parties involved in the supply chain such as suppliers, customers, focal firms and logistics service providers can provide a more holistic view of the impact of SSCM and CE on sustainable performance. Finally, future research can explore additional factors that may impact the association between SSCM and CE and SP.

CRedit authorship contribution statement

Md Shamimul Islam: Writing – original draft, Methodology, Conceptualization. **Mohammad Rabiul Basher Rubel:** Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization. **Nadia Newaz Rimi:** Writing – review & editing, Writing – original draft, Conceptualization. **Mohammad Bin Amin:** Writing – review & editing, Resources, Funding acquisition, Conceptualization. **Proma Quadir:** Writing – review & editing, Writing – original draft.

Declaration of competing interest

All authors have reviewed and endorsed the manuscript's content, and there are no conflicts of interest to declare. We certify that the submission is original work and is not under review of any other journals.

Data availability

Data will be made available on request.

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