

# The Role of Green Innovation in Strengthening CSR to Enhance Sustainable Performance in the Era of the Global Climate Crisis

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**Abstract.** This study examines the mediating function of Green Innovation in the association between corporate social responsibility (CSR) initiatives and sustainable performance. It adopts a quantitative approach by collecting data from 129 recycling companies across various provinces in Indonesia through structured questionnaires distributed online. Partial Least Squares Structural Equation Modeling was conducted using the SmartPLS software to examine Green innovation's function as a mediator between sustainable performance and CSR. The results indicate that green innovation has a pivotal mediating role between CSR initiatives and sustainable performance in Indonesia's recycling sector. These results underscore the importance of long-term commitment and strategic alignment in overcoming short-term costs and complexities associated with implementing sustainability initiatives in an emerging industry. This study reveals the strategic role of companies in natural resource management as key to achieving sustainable performance amid the global climate crisis. It highlights the integration of environmental efforts, competitive capabilities, and sustainable innovation as a holistic approach rarely explored in the recycling industry of developing countries such as Indonesia. Positioning company capability as the main mediator, the study offers new insights into creating sustainable added value and strategic guidance for policymakers and practitioners. Additionally, it supports environmental, social, and governance and circular economy agendas, contributing significantly to the transition toward a green economy and sustainable development. In the domain of economics, this research can be attributed to the JEL Classification Code Q01; Q56; M14; L26; O31.

**Keywords:** Sustainable Performance, Green Innovation, CSR, Indonesia.

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# 1 Introduction

In the modern era, companies must address their environmental impact alongside innovating in operations, finance, competitiveness, and products. Environmental issues have become a central focus in the global economic discourse on sustainability. According to [1]–[3], the Triple Bottom Line method emphasizes growth that meets present needs without compromising the ability of future generations to meet their own [4]–[6]. Many manufacturing firms have responded by adopting eco-friendly practices. Individuals' contributions to sustainability are influenced by their attitudes and level of environmental safety awareness [7]–[9]. Companies' commitment to social welfare and sustainable development is reflected in their corporate social responsibility (CSR) initiatives [10], [11]. Beyond traditional CSR, green innovation (GI) is acknowledged as a strategic competency for attaining long-term sustainability through innovations in products, processes, and management [12], [13]. Recycling is essential for mitigating environmental damage and conserving resources [14]–[16].

Stakeholder theory posits that corporations are obligated to fulfill the expectations of diverse entities, including consumers, employees, communities, and the environment [17]–[19]. In Indonesia's recycling industry, CSR reflects companies' commitment to sustainability [20]–[22]. Integrating sustainability principles and green innovation strengthens stakeholder relations, enhances competitiveness, and improves firm performance [23], [24]. At the 40th UNESCO General Conference in 2019, Indonesia reaffirmed its commitment to sustainable development. The recycling sector processes 2.54 million tons of waste annually and generates 3 million jobs [25], yet 40.06% of the nation's 33 million tons of waste remains unmanaged [26]–[28]. This study investigates the mediating role of competitive advantage in the relationship between CSR and SP in Indonesia's recycling industry. Previous research has mainly focused on the effects of eco-friendly practices on competitive advantage and economic outcomes, with limited attention to social dimensions. Thus, this study offers a comprehensive analysis of sustainability within Indonesia's recycling industry and addresses gaps in existing literature.

The article is structured as follows. Section 2 provides a comprehensive analysis of the theoretical framework and hypothesis formulation. Section 3 describes the data collection procedures and research approach. The article then presents a comprehensive review of the topic along with its main findings in Section 4. Section 5 addresses the study's limitations, theoretical and practical implications, and proposes directions for future research.

## 2 Literature Review and Hypotheses

Stakeholder theory asserts that organizations must meet the needs and expectations of diverse stakeholders, including customers, employees, communities, and the environment [17], [29], [30]. In the context of this study, CSR represents a tangible expression of a company's accountability to its stakeholders, particularly within Indonesia's recycling industry [20], [31], [32]. By integrating GI and sustainability principles, companies not only foster harmonious stakeholder relationships but also strengthen their competitive advantage [23], [33], [34]. Ultimately, this dynamic positively impacts firm performance, as satisfied stakeholders and a well-preserved environment support business continuity and the sustainable, effective attainment of corporate objectives [24], [35], [36].

According to [37]–[39], sustainable performance (SP) represents a type of GI that amalgamates economic, social, and environmental considerations into a holistic performance assessment. Economic performance is measured by profit growth, market share, and customer base expansion [40], [41]. Social performance reflects contributions to community well-being, employee welfare, and safe working conditions [42]–[44]. Environmental performance involves efforts to minimize resource consumption and maximize the use of renewable resources [45]. According to [1], CSR is an ethical commitment to social welfare, environmental sustainability, and economic development. CSR includes programs focused on social safety, product safety, and

eco-friendly practices [45]–[48]. Product and process innovations aimed at energy conservation and environmentally friendly design are also part of CSR [49], [50]. According to [51]–[53], GI denotes a company's capacity to attain exceptional performance via cost leadership, differentiation, or market focus tactics.

The digitalization and integration of technologies like IoT and AI are progressively enhancing GI and CSR initiatives. These technologies provide real-time surveillance of energy and waste, improving operational efficiency and environmental responsibility [54], [55]. Engagement with stakeholders and transparent sustainability reporting are essential in the Industry 4.0 era, demonstrated to enhance reputation and SP, particularly for SMEs in emerging economies [56], [57]. The amalgamation of green innovation, corporate social responsibility, and modern technology propels the attainment of superior and highly competitive SP.

Recent research highlights that the implementation of CSR positively influences SP [18], [58]. The adoption of sustainable practices such as effective resource management, emission reduction, and waste minimization is integral to corporate social responsibility and fosters sustainable economic growth [45], [59]. Furthermore, SP can be augmented by implementing competitive strategies such as cost leadership, product differentiation, and innovation, which are essential for tackling increasingly intricate competitive difficulties in dynamic marketplaces [18], [60], [61]. These strategies not only open new market opportunities but also strengthen corporate reputation and brand image [18], [62]. Additionally, they contribute significantly to improving financial outcomes and overall competitiveness in both domestic and global arenas [63]–[65]. Therefore, for businesses looking to achieve sustainable growth and keep a competitive advantage in the rapidly changing business climate of today, combining CSR with strong competitive strategies is essential [66], [67].

Recent studies also confirm that the adoption of digital innovation, particularly generative artificial intelligence (GAI), greatly modifies the connection between corporate ESG performance and digital innovation. Empirical research using panel data from 2015 to 2023 indicates that digital innovation drives increased adoption of GAI, which in turn substantially enhances ESG performance [52], [53], [68]. Furthermore, in China, high-quality corporate carbon disclosure has been shown to improve financial performance, including return on investment (ROE) and Tobin's Q, and to reduce stock price volatility [69]–[71]. The integration of digital transformation, transparent emissions reporting, and strategic CSR enables companies to create stronger long-term value and maintain the company's ability (CA).

CSR has a positive impact on SP [72], [73] and significantly alters the relationship between digital innovation and business environmental, social, and governance (ESG) performance [74]–[76]. However, without the mediating function of green innovation, the direct effect of business initiatives to manage natural resources based on economic performance would not attain its full potential [77], [78]. This capability enables firms to leverage green innovation generated from sustainable performance into added value in competitive markets [77], [79], [80]. Through this capability, companies can integrate CSR to improve cost efficiency, thereby enhancing profitability and market share [51], [81], [82]. Consequently, green innovation mediates the connection between CSR and SP, hence enhancing the beneficial impacts of these initiatives on SP [75], [83], [84].

The importance of green innovation as a mediator between CSR and SP is further shown by recent studies. The association between CSR and GI, for instance, is consistently significant across a variety of industries, particularly in North America, and is shown to be higher in research that uses primary data, according to a meta-analysis of 29 empirical articles [85]–[87]. GI has also been demonstrated to considerably mediate the relationship between CSR and both financial and environmental performance in the Chinese manufacturing sector [88]–[90]. These findings indicate that GI not only bridges CSR and SP but also enhances the effectiveness of CSR strategies in achieving more optimal and sustainable outcomes. Therefore, the following hypotheses are stated based on the above-discussed insights: *H1 – CSR has a positive effect on the GI, H2 – The CA*

has a positive effect on SP, H3 – CSR has a positive effect on SP, and H4 – CSR has a positive effect on SP through the GI.

### 3 Research Approach

This study examines the function of GI as a mediating variable in the relationship between SP and CSR using a quantitative approach. Two control variables, environmental sustainable development (ESD) and CA, are also included to strengthen and enhance the research findings.

#### 3.1 Population and Samples

As stated in the previous sections, this study focuses on the recycling industry in Indonesia, specifically targeting companies that manage waste bank systems and process waste materials such as plastic, paper, textiles, and wood into value-added products, including furniture, organic fertilizers, and handicrafts. The selection of this industry is motivated by the limited research available on the recycling sector. Furthermore, this industry actively promotes sustainability and is increasingly recognized as a viable alternative solution to environmental challenges, demonstrating strong potential for future development in Indonesia [91]–[93], with the research data details as follows.

To seek answers regarding the hypothesis stated in Section 2, 241 questionnaires were sent to recycling businesses in Indonesia in order to gather data. To these questionnaires, 129 valid replies were received, representing a 53.5% response rate. Table 1 displays the characteristics of the respondents, including gender, educational background, and employment position, which were respected while further analyzing the obtained data.

The features of the businesses, such as the kind of recycling, prior company experience, and the province-by-province classification of the research region, are detailed in Table 2. The profiles of the businesses participating in this survey, as well as the backgrounds of the respondents, are better understood thanks to this data.

**Table 1.** Respondent Characteristics

Respondent Characteristics	Category	Frequency (n=129)	Percentage (%)
Gender	Male	83	62.8
	Female	46	37.2
Educational level	Junior high school	3	2.3
	Senior high school	31	23.3
	Bachelor	77	60.5
	Master	18	14
Position	Owner	64	48.8
	Manager	65	51.2

*Data processed by the authors in 2025*

According to the characteristics listed in Table 1, the majority of respondents (62.8%) were men, and 37.2% were women. Regarding their education level, the majority of respondents (60.5%) had a bachelor’s degree, followed by those with a master’s degree (14%), a senior high school diploma (23.3%), and a junior high school diploma (2.3%). Regarding the position in the company, owners made up 48.8% of job roles, while managers made up 51.2%, indicating a fairly balanced ratio between the two groups. These results show that the majority of respondents hold important roles in their organizations and have a high level of education, which suggests giving pertinent information for the analysis carried out in this study.

**Table 2.** Company Characteristics

<b>Company Characteristics</b>	<b>Category</b>	<b>Frequency (n=129)</b>	<b>Percentage (%)</b>
Recycling type	Plastic	61	46.5
	Paper	11	9.3
	Textile	8	7
	Glass	4	2.3
	Domestic Waste	17	14
	Used cooking oil (UCO)	10	7
	Organic	11	9.3
	Electronic	4	2.3
	Wood	3	2.3
Business experience	Less than 3 years	58	44.2
	3-6 years	34	25.6
	7-9 Years	30	23.3
	More than 10 years	7	7
<b>Geographical area of research</b>	<b>Category</b>	<b>Frequency (n=129)</b>	<b>Percentage (%)</b>
Province	D.I. Yogyakarta	39	22.5
	DKI Jakarta	27	16.3
	Central Java	18	15.5
	East Java	16	8.5
	West Java	19	15.5
	Bali	7	5.4
	Riau	3	1.6

*Data processed by the authors in 2025*

Table 2 describes the characteristics of the companies, showing that the majority operate in plastic recycling (46.5%), followed by domestic waste (14%), as well as paper and organic recycling (each 9.3%). Meanwhile, recycling of textiles, used cooking oil, glass, electronics, and wood comprises smaller proportions. In terms of business experience, 44.2% of companies have been operating for less than three years, 25.6% for 3–6 years, 23.3% for 7–9 years, and only 7% have operated for more than ten years. Geographically, most companies are located in D.I. Yogyakarta (22.5%), followed by DKI Jakarta (16.3%), and several other provinces in Java and Bali.

### 3.2 Procedures and Data Collection

An online survey employing a structured electronic questionnaire (Google Form) was used to gather data for this investigation. The questionnaires were distributed to company representatives via contact information obtained from official websites and social media platforms. All factors were evaluated using a five-point Likert scale with the aim of determining the connections between predetermined constructs. This study uses independent, dependent, mediating, and control variables. The measurement indicators were carefully refined to ensure reliable responses and minimize bias. The details on the indicators are provided in Appendix.

### 3.3 Method of Data Analysis

Descriptive analysis is used in this study to look at respondent profiles and recycling company characteristics. To assess and interpret the mediating function of GI between CSR and SP, the

gathered data were analyzed using the partial least squares structural equation modeling (SEM-PLS) approach via the SmartPLS software<sup>†</sup>.

## 4 Research Results and Discussion

### 4.1 Research Results

#### 4.1.1 Descriptive Statistics

SmartPLS is used for data analysis due to its suitability for models incorporating mediating variables, constrained sample sizes, and multi-faceted structures. Moreover, SmartPLS provides validation assessments absent in IBM SPSS software<sup>‡</sup>, including convergence and discriminant validity tests [94]–[96]. Table 3 displays the descriptive statistics. Since no values fall below the threshold of 2, the data show a normal distribution, according to the skewness and kurtosis measures [94], [97], [98].

**Table 3.** The Statistics Descriptive

Variable	Mean	Min	Max	Standard Deviation	Kurtosis	Skewness
Company's Ability (CA)	0.000	-2.109	1.296	1.000	-1.143	-0.157
Corporate Social Responsibility (CSR)	0.000	-2.769	0.746	1.000	0.030	-1.151
Environmental Sustainable Development (ESD)	0.000	-3.190	0.734	1.000	1.775	-1.560
Green Innovation (GI)	0.000	-2.817	0.837	1.000	-0.067	-1.018
Sustainable Performance (SP)	0.000	-3.082	1.475	1.000	0.603	-0.566

*The data is derived from the output of the SmartPLS software in 2025.*

#### 4.1.2 Internal consistency, Reliability, and Validity, R Square, f Square, and Q2 Evaluation

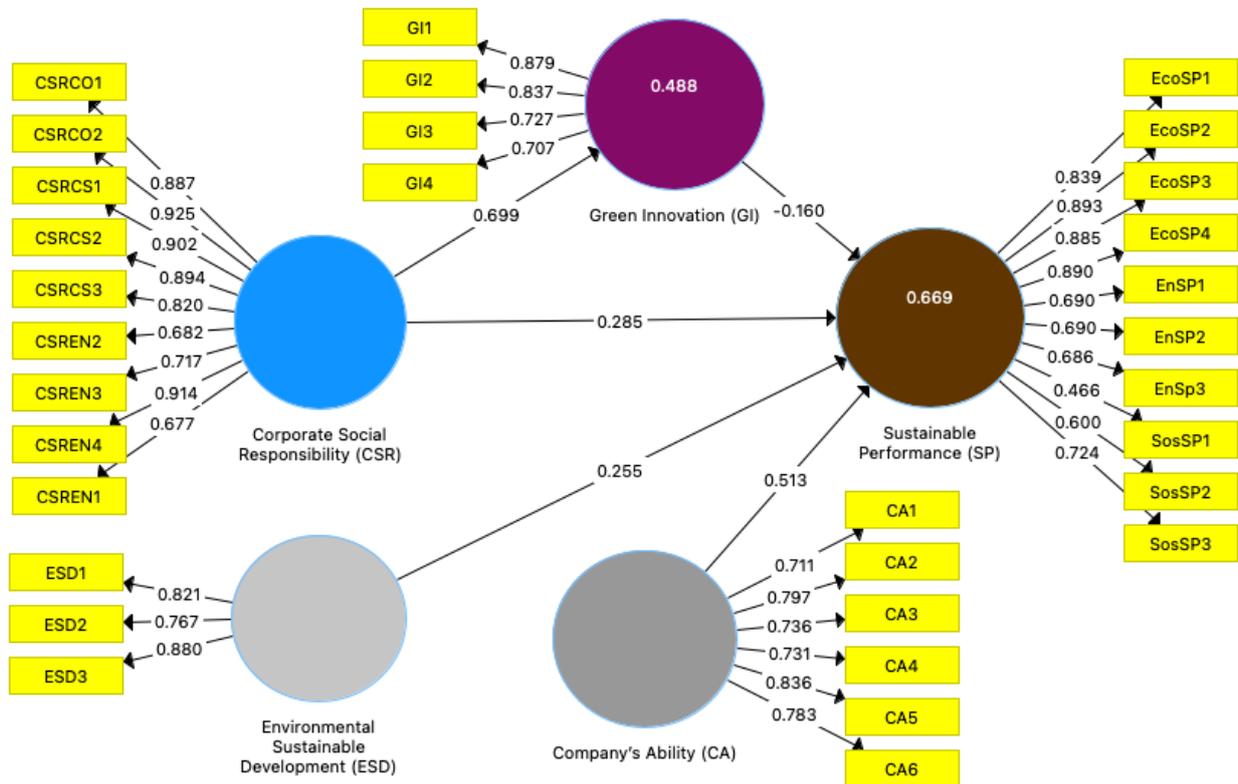
When initially implementing SmartPLS, we employed an algorithmic technique to assess factor loadings, validity, and reliability (see Figure 1). As shown in Table 4, every item in our sample has the required factor loadings for reliability (about or above 0.70), and no significant cross-loadings between items were found. Every construct satisfies the stipulated reliability and validity criteria set by [94], [99], and [100], with internal consistency (of Cronbach's Alpha and rho\_A) and convergent validity (AVE) exceeding 0.70 and 0.50, respectively. Additionally, every construct has composite dependability above the 0.70 cutoff, which is satisfactory based on the dependability criteria set by [94] and [101]. The validity and reliability findings for each construct are shown in Table 4.

The links between latent constructs in a research model are evaluated using SmartPLS's Structural Model method. This process includes path estimation, significance testing, and evaluation of the R<sup>2</sup> value. According to [101]–[103], this algorithm ensures the comprehensive predictive validity of the structural model [102], [104], [105]. The model is illustrated in Figure 1.

Figure 1 illustrates the approach for Structural Model 1 analysis using SmartPLS, consisting of five latent constructs: CSR, GI, SP, ESD, and CA. Each construct is measured by several indicators with factor loadings above 0.6, indicating good indicator validity. The R<sup>2</sup> values for GI (0.488) and SP (0.669) reflect the extent of influence from independent to dependent variables. Path coefficients, which are utilized to test the hypotheses in the research model, show the direction and degree of links among components.

<sup>†</sup> SmartPLS <https://smartpls.com/>

<sup>‡</sup> <https://www.ibm.com/products/spss>



**Figure 1.** Structural Model 1

**Table 4.** Reliability, Validity, R Square, f Square, and Q2 Evaluation

Variable	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Company's Ability (CA)	0.861	0.870	0.895	0.588
CSR	0.942	0.952	0.952	0.689
Environmental Sustainable Development (ESD)	0.766	0.799	0.863	0.679
Green Innovation (GI)	0.797	0.812	0.869	0.625
Sustainable Performance (SP)	0.907	0.922	0.925	0.560
Variable	R Square	R Square Adjusted		
Green Innovation (GI)	0.488	0.484		
Sustainable Performance (SP)	0.669	0.659		
f-Square	GI	SP		
Company's Ability (CA)		<b>0.373</b>		
Corporate Social Responsibility (CSR)	<b>0.953</b>	0.088		
Environmental Sustainable Development (ESD)		0.089		
Green Innovation (GI)		0.031		
Constructs	Q <sup>2</sup>			
Green Innovation (GI)	0.297			
Sustainable Performance (SP)	0.357			

The data is derived from the output of the SmartPLS software.

According to the R-squared table, the GI accounts for 49% of operational success, with external factors outside the purview of this investigation influencing the remaining 51%. Additionally, the

R-squared results show that 67% of SP is attributable to operational performance, with the remaining 33% being attributed to other factors not included in this study. The designated cutoff points for calculating f-Square, as outlined by [94], [106], and [107], are listed in the following order: 0.02 denotes a very little effect, 0.15 a moderate effect, and 0.35 a large effect, which correspond to minor, medium, and big impacts, respectively. According to the study, CSR significantly and moderately affects both GI and SP, with an effect size larger than 0.95 for GI.

As noted by [94] and [108], when the model's  $Q^2$  value is greater than zero, predictive significance for particular endogenous constructs is verified. A  $Q^2$  value of zero or below, on the other hand, denotes a lack of predictive relevance. With a  $Q^2$  value of 0.30 in this investigation, the GI variable surpasses the zero criterion and demonstrates its predictive power. Additionally, the  $Q^2$  value of 0.36 for the SP variable confirms its predictive importance.

#### 4.1.3 Correlation and Heterotrait-Monotrait Ratio (HTMT)

The adequacy is indicated by an HTMT ratio below 0.90. The results of our investigation, illustrated in Table 5, show that all of the HTMT values fall below the 0.90 cutoff, meeting the required validity standards.

**Table 5.** Correlation and Heterotrait-Monotrait Ratio

Variable	CA	CSR	ESD	GI	SP
<b>Correlation</b>					
Company's Ability (CA)	0.767				
Corporate Social Responsibility (CSR)	0.710	0.830			
Environmental Sustainable Development (ESD)	0.569	0.663	0.824		
Green Innovation (GI)	0.606	0.699	0.697	0.791	
Sustainable Performance (SP)	0.764	0.708	0.625	0.528	0.749
<i>The bolded values adjacent to the correlations represent the Fornell-Larcker criterion.</i>					
<b>HTMT</b>					
Company's Ability (CA)					
Corporate Social Responsibility (CSR)	<b>0.765</b>				
Environmental Sustainable Development (ESD)	<b>0.671</b>	<b>0.744</b>			
Green Innovation (GI)	<b>0.734</b>	<b>0.782</b>	0.859		
Sustainable Performance (SP)	<b>0.834</b>	<b>0.761</b>	<b>0.736</b>	<b>0.623</b>	

*The data is derived from the output of the SmartPLS software in 2025*

Using the resampling technique, SmartPLS's Structural Model 2 (bootstrapping), reflected in Figure 2, is used to examine the importance of correlations between constructs. This process generates t-statistics and p-values, which are used to statistically test the hypotheses [102].

The findings of the SmartPLS analysis of the Structural Model 2 (bootstrapping) are shown in Table 6. T-statistics and p-values, which show the importance of the correlations, are included in parentheses for each path between constructs. A link is considered statistically significant if the t-statistic is more than 1.96 and the p-value is less than 0.05. These findings support the hypothesis testing by demonstrating the empirical validity of the links between the study model's constructs [102].

This study employed 2,000 resamples and SmartPLS's bootstrapping technique to examine the proposed relationships. The results support hypothesis H1 (see Figure 2 and Table 6), indicating that CSR significantly influences GI ( $T = 17.007$ ,  $p = 0.000^{***}$ ). Nonetheless, hypothesis H2 is unsupported, as the beneficial influence of GI on SP is not statistically significant, despite the p-value being marginally near significance ( $T = 1.800$ ,  $p = 0.072$ ). Hypothesis H3 is substantiated by the notable favorable impact of CSR on SP ( $T = 3.424$ ,  $p = 0.001^{***}$ ). Among the control

variables, ESD significantly influences sustainable economic performance SP, but CA does not exhibit a notable effect on it.

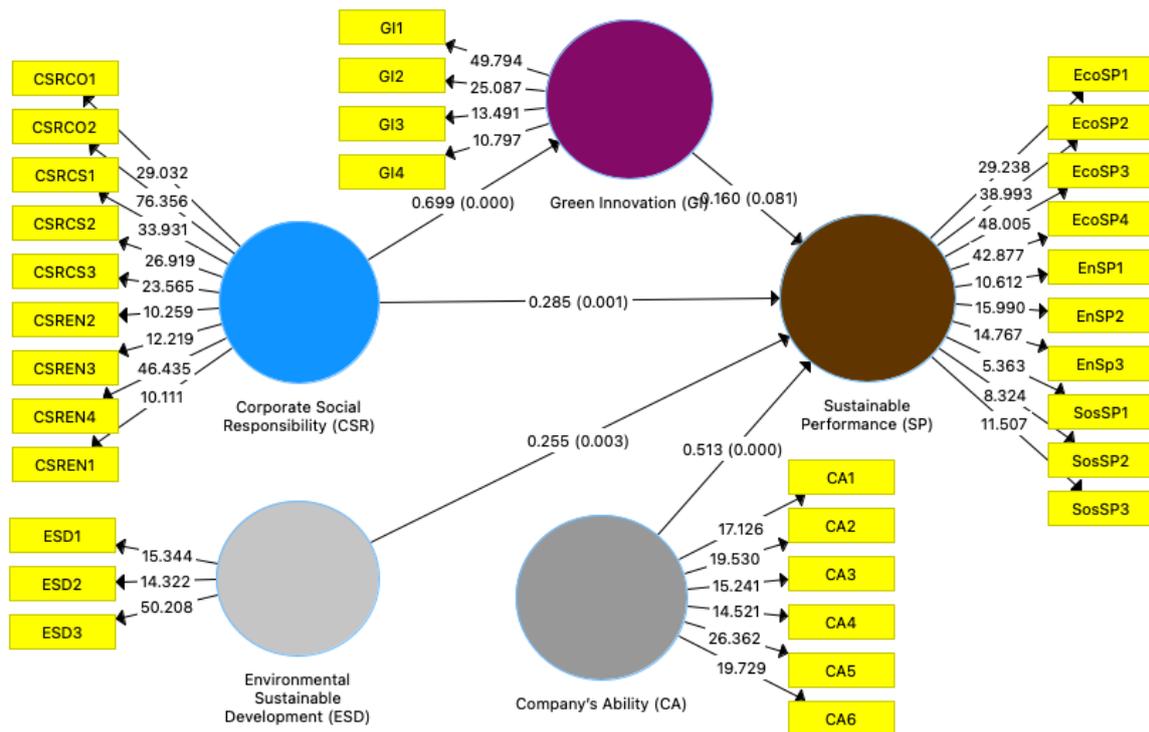


Figure 2. Structural Model 2 (bootstrapping)

Table 6. Direct Effects and Indirect Effects

Direct Effects	Original Sample (O)	T Statistics	P Values	Information
H1_ CSR -> GI	0.699	17.007	0.000***	Accepted
H2_ GI -> SP	-0.160	1.800	0.072	Rejected
H3_ (CSR) -> SP	0.285	3.424	0.001***	Accepted
<b>Control Variable</b>				
ESD -> SP	0.255	3.141	0.002***	Accepted
CA -> SP	0.513	6.413	0.000***	Accepted
<b>Indirect Effects</b>				
H4_ CSR -> GI -> SP	0.280	3.420	0.007**	Accepted

Note: \*\*\* stays for sig<0,01, \*\* stays for sig<0,05, \* stays for sig<0,1;

Hypothesis H4 is validated, demonstrating that CSR exerts a positive and statistically significant direct influence on SP (T = 3.424, p = 0.001\*\*\*). Furthermore, CSR indirectly influences SP through GI, as presented in Table 6 and Figure 2. Although the direct effect on SP is relatively smaller compared to the indirect effect, the indirect effect via GI is significant (T = 3.420, p = 0.007\*\*). These findings highlight the pivotal mediating role of GI in enhancing corporate sustainability by fully mediating the impact of CSR on SP.

## 4.2 Discussion

This study emphasizes the intricate difficulties the recycling sector faces in attaining long-term discriminant validity performance, especially in the Indonesian context [109]. It also examines the mediating role of GI in the relationship between CSR and SP [110]. CSR initiatives, whether

oriented toward customers, communities, or the environment, tend to have a more pronounced direct impact on economic performance. However, their influence on environmental and social dimensions remains limited unless integrated with sustainable development practices [110], [111].

CSR plays a pivotal role in enhancing the effective and responsible utilization of corporate resources, particularly in driving the achievement of more optimal CSR outcomes [112]–[114]. The implementation of CSR not only supports ecosystem preservation but also strengthens social relationships with surrounding communities [115], [114]. Furthermore, a company's capability to excel demonstrates a significant positive relationship with CSR implementation and directly contributes to improved sustainable performance [116], [117]. However, the mediating role of GI remains limited, indicating that CSR implementation in supporting SP is still in its early stages [118], [119]. Therefore, better strategic alignment and increased investment are necessary to optimize the long-term benefits of CSR implementation [120], [121].

It should be noted that GI is a key strategic asset that significantly influences all dimensions of SP and serves as an effective mediator in the relationship between CSR and SP [122], [123]. This competence allows firms to effectively utilize their resources and competencies, thereby generating sustainable added value that differentiates them from competitors [122], [123]. In the context of the recycling industry, companies that successfully integrate CSR with process innovation are better positioned to maintain their GI [124]. Therefore, it is pivotal for recycling companies to translate CSR into unique business strategies that are difficult for competitors to imitate [83], [125]. Strategies such as GI, process efficiency, and product differentiation can be key to overcoming market challenges while supporting the company's sustainability goals [126]. Thus, GI is not only a source of business strength but also a primary driver in achieving SP [123], [127].

Overall, this study emphasizes that sustainability in the recycling industry is not solely driven by CSR, but rather by an integrated approach that combines CSR, GI, and SP [128]. This sustainability also encompasses interconnected aspects of SP, innovation, and competitiveness [129], [130]. In the context of Indonesia, although some recycling companies demonstrate potential, many remain in the early stages and face economic disparities across regions [131], [132]. Therefore, future research should consider more mature industries and explore how regional disparities influence the adoption and sustainability of CSR practices [133], [134]. Further studies are also expected to identify factors influencing CSR implementation and to examine effective strategies to enhance competitiveness in markets increasingly oriented towards sustainable performance [135], [136].

## 5 Conclusion

This study reveals that CSR has a significant direct positive impact on sustainable performance. Furthermore, green innovation acts as a mediator in the relationship between CSR and sustainable performance. Green innovation has been proven to be a critical strategic asset, providing leverage in utilizing the company's resources and capabilities to create sustainable added value. For recycling companies, strategies encompassing sustainable innovation, process efficiency, and product differentiation are essential to maintain competitive positioning in an increasingly dynamic market. This study also recommends that future research explore the role of digital technologies and the circular economy in enhancing sustainable performance, as well as the adaptation of strategies to address climate change and increasingly stringent environmental regulations.

This study is limited by its focus on green innovation as a mediator between CSR and Sustainable Performance. Other potentially influential variables, such as economic or technological factors, have not been analyzed. Additionally, the cross-sectional data used do not capture the dynamic changes over time.

Future research is recommended to broaden the scope by including additional external and internal factors that may affect Sustainable Performance. Moreover, the use of longitudinal data could provide a more comprehensive understanding of the relationships among variables over an extended period. Expanding the sample to include various industry sectors may also enhance the generalizability of the findings.

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## Appendix

### The details of the questionnaire

Variable	Indicator	A list of questions
<b>Corporate Social Responsibility (CSR)</b> A company's concern for its surrounding environment reflects a strategic commitment that contributes to the achievement of sustainable performance.	Engagement in environmental preservation efforts	The company actively implements programs to reduce carbon emissions and utilize renewable energy sources.
	Allocates investments to benefit future generations	The company promotes diversity and inclusion in the workplace, including aspects of gender, disability, and cultural background.
	Implements programs to minimize its negative impact on the natural environment.	The company maintains transparency in reporting CSR activities to the public and stakeholders.
	Long-Term Sustainability Orientation	The company provides tangible support for employees' mental health and well-being.
	Contributes financially to charities	The company contributes to local community development through education, training, or economic empowerment programs.
	Contributes to the well-being of society.	The company ensures its supply chain is free from forced labor and child exploitation practices.
	Commits to protecting consumers beyond the minimum legal standards	The company utilizes technology responsibly, including safeguarding consumer data privacy and security.
	Accessible and honest information	The company actively participates in efforts to mitigate the impacts of climate change, such as water conservation and waste management.
	Ensuring customer satisfaction is a top priority	The company openly receives and responds to community feedback or complaints related to its CSR activities.
<b>Green Innovation (GI)</b> Green innovation, which focuses on creating eco-friendly products, processes, or technologies, emphasizes efficient use of resources and seeks to minimize negative impacts on the environment.	Recycled materials	My company actively adopts environmentally friendly technologies to reduce negative environmental impacts.
	Product recycling	Green product innovation in my company receives full support from management.
	Use of resources	Employees in my company regularly receive training related to green innovation practices.
	Green production system	My company collaborates with external parties to develop innovative and sustainable solutions.

Variable	Indicator	A list of questions
<b>Sustainable Performance (SP)</b> The level of achievement or outcomes attained, considering economic, social, and environmental aspects in performance evaluation.	Return on Assets (ROA)	My company consistently implements sustainability principles in every business process.
	Profit growth	My company prioritizes the use of renewable resources in daily operations.
	Sales growth	My company regularly reports sustainability performance to stakeholders.
	Market share growth	Waste and emission reduction initiatives are effectively implemented in my company.
	Improved relationship with the community and stakeholders	My company has clear policies regarding social and environmental responsibility.
	Enhance the living quality of the local community	Employee well-being is a primary focus in my company's sustainability strategy.
	Improved work safety	My company actively engages in social activities to support the local community.
	Improved compliance with environmental standards	Sustainable innovation is part of my company's strategic objectives.
	Reducing the amount of hazardous chemicals generated	My company is committed to increasing energy efficiency throughout all operational processes.
	Reduction of energy consumption	My company regularly evaluates the environmental impact of all business activities.
<b>Environmental Sustainable Development (ESD)</b> Corporate efforts in managing natural resources responsibly reflect a commitment to environmental stewardship and sustainable development.	Handled or stored toxic waste responsibly.	My company actively contributes to the preservation of biodiversity around its operational environment.
	Eco-friendly processes and products	Waste management in my company is carried out by considering the principles of sustainable development.
	Mitigation of environmental impacts resulting from production processes	My company supports the use of renewable energy to reduce the impact of climate change.
<b>Company's Ability (CA)</b> A company's ability to outperform other companies in the same industry or market. This is achieved by leveraging the company's unique characteristics and resources.	The resulting Value	My company is able to quickly adapt to changes in applicable environmental regulations.
	Rareness	My company has competent human resources to support sustainable innovation.
	Imperfectly non-imitable	My company manages business risks effectively in facing global challenges, such as climate change.
	Product differentiation	My company is able to integrate digital technology to improve operational efficiency.
	R&D capabilities	My company consistently enhances internal capacity through employee training and development.
	Managerial Capabilities	My company is responsive to customer needs and expectations regarding environmentally friendly products or services.

The source data were processed by the author in 2025