

# The Triple Green Framework for Supply Chain Sustainability: Corporate Social Responsibility, Green Leadership, and Sustainable Finance as Drivers of Performance

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## Abstract

This study examined the role of the Triple Green Framework in improving supply chain sustainability performance through the integration of Corporate Social Responsibility (CSR), green leadership, and sustainable finance. The research investigated how environmentally responsible governance, leadership commitment, and sustainable financial strategies influenced organizational sustainability outcomes within manufacturing and logistics firms. A quantitative research design was employed using a structured survey questionnaire distributed among 320 managers and professionals involved in supply chain and sustainability operations. The study applied descriptive statistics, correlation analysis, regression analysis, and Structural Equation Modeling (SEM) to evaluate the relationships among the variables. The findings revealed that CSR significantly improved supply chain sustainability performance with  $\beta = 0.71$  and  $p = 0.000$ , while green leadership demonstrated a positive influence with  $\beta = 0.68$  and  $p = 0.000$ . Sustainable finance emerged as the strongest predictor with  $\beta = 0.74$  and  $p = 0.000$ . The model summary reported an  $R^2$  value of 0.709, indicating that 70.9% of the variance in supply chain sustainability performance was explained by the Triple Green Framework variables. The study concluded that organizations implementing integrated sustainability strategies achieved stronger environmental efficiency, operational resilience, and long-term competitive advantage. The findings provided theoretical and practical contributions for policymakers, sustainability managers, and organizational leaders seeking effective green transformation strategies within modern supply chain systems.

**Keywords:** Corporate Social Responsibility, Green Leadership, Green Transformation, Supply Chain Sustainability, Sustainable Finance, Sustainability Performance.

## INTRODUCTION

The complex nature of today's environment, stakeholder and regulatory challenges came to the fore and put sustainability high on the agenda for system in global supply chains. Companies

integrated into their businesses sustainable business approaches to reduce environmental effects and increase their short-, medium- and longer-term organizational flexibility. Corporate Social Responsibility (CSR) was a major focus point as it added to the sense of ethics in operations, environmental responsibility and stakeholder confidence between supply chains. Study findings revealed organizations that adopted socially responsible approaches experienced enhanced operational efficiency and environmental benefits through sustainable procurement, waste minimisation and eco-friendly production systems (Liao et al., 2024; Paulraj et al., 2017). The Environmental and Social criteria of the Sustainable operations of business encouraged companies to re-design the activities of their supply chain, mainly in the manufacturing and logistics industries. Sustainable supply chain management (SSCM) also strengthened the organizational legitimization process and facilitated the development of relationships with suppliers, customers and communities (Raza et al., 2021; Mughal et al., 2023).

Green leadership also was crucial for cultivating organizational cultures that were more sustainable, and for fostering environmentally responsible decision-making processes. Through green innovation strategies, sustainable operational policies and resource optimization initiatives, organizational leaders affected employees' environmental commitment. A transformational and green servant leadership style facilitated firms to incorporate sustainability issues into the main business activities and supply chain management. Recent research identified that green leadership has a positive effect on the green supply chain management, green innovation, and sustainable performance of the organizations (Abbas, 2024; Yu et al., 2026).

With the need for substantial financial resources for building green technologies, renewable energy systems and environmentally friendly production mechanisms, sustainable finance became yet another key enabler of supply chain sustainability. These financial institutions have been playing an increasing role in providing support for sustainability investments via green financial instruments, environmental risk assessment models and the ESG approach to funding. Firms gained in their capacity to adopt low-carbon technologies and operational frameworks that are environmentally responsible through sustainable finance. Researchers found that sustainable financial management boosted the effectiveness of green supply chains and environmental control measures, and fostered long-term business competitiveness (Liao et al., 2024; Rana et al., 2026). CSR, green leadership and sustainable finance were integrated into a comprehensive sustainability framework that could enhance the performance of their supply chain and their competitiveness as an organization. Existing literature focused primarily on studying these sustainability dimensions in isolation; scarce studies studied the impact of these dimensions together on supply chain sustainability performance. The Triple Green Framework, therefore, enabled a multidimensional perspective to be adopted to analyse the interaction between the three pillars (CSR practices, environmentally responsible leadership and sustainable financial strategies) within the context of organisational sustainability outcomes. This framework adds to the existing literature on sustainable supply chains, which brought together managerial, ethical and financial components into a comprehensive sustainable supply chain model (Lodhi et al., 2025; Ahmad & Karadas, 2021).

## **Background of the Study**

The environmental degradation, carbon emission, resources depletion, and ecological instability, that global industrial expansion brought caused organizations to re-think about what they've known as business as usual supply chain management. There was a growing business understanding that economic growth that was not environmentally sustainable introduced some long-term operational

and reputational risks. In this context, organisations prioritise sustainable supply chain management as a business strategy to reconcile businesses' economic goals and environmental and social aspects. Further, the application of green supply chain practices, which include eco-design, green manufacturing, reverse logistics and sustainable procurement, evolved into one of the most critical instruments for enhancing organizational sustainability and enabling organizations to minimize their environmental and ecological footprints (Raza et al., 2021; Abbas, 2024).

The stakeholders increasingly called for transparency and ethical governance through CSR along with sustainable behavior of the company became important. Organizations implemented CSR programs that had a positive social, environmental, and corporate impact. Organizations launched initiatives for CSR, which positively impacted on social welfare, the environment and corporate reputation. CSR also had a positive impact on the sustainability of the supply chain through codes of conduct and awareness of the need for ethically responsible practices; environmentally responsible production systems; and sustainable stakeholder relationships. The study results proved that CSR brought positive impact on green supply chain efficiency and environmental performance and on organization sustainability outcomes (Liao et al., 2024; Mughal et al., 2023). Green leadership also contributed to sustainable organizational transformation by fostering environmental leadership in organizations and creating a sustainable organizational culture. Leaders' effect on employee behaviour and organisational approaches was through support of sustainability vision, environmental awareness and innovation. Shared to organizations, green leadership made them consider cleaner technologies, an operational system and processes that are environmentally friendly and utilizing resources efficiently in supply systems. Researches reported that transformational and green servanthood had a positive effect on green innovation, commitment to the environment and sustainable organizational performance (Yu et al., 2026; Abbas, 2024).

Sustainable finance was also one of the key drivers of organisation sustainability as continuous investments in environmental technologies and sustainable infrastructure were needed for green transformation. Financial institutions and investors increasingly prioritized assets related to the ESG issues to support the environmentally responsible business operation. Organizations were able to implement renewable energy systems, low emission production technologies, and sustainable operational frameworks, thanks to sustainable finance methods. Researchers highlighted that environmentally-conscious financial approaches enhanced supply chain resiliency, sustainable performance, and long-term business development (Rana et al., 2026; Paulraj et al., 2017).

## **Research Problem**

While many would like to see more accomplished business sustainability as part of the supply chain, integration between CSR practices, green leadership and sustainable finance remained weak for many companies and were therefore sources of continued challenges in achieving sustainable supply chain. Organized frameworks were often missing for integrating sustainability strategies that can solve environmental, social and financial problems together, in addition to implementing focused sustainability strategies. Nevertheless, a large number of companies began to carry out CSR policies that were poorly supported by the leadership of the organizations and lacked enough sustainable funding for sustainable programmes in supply chain.

## **Research Objectives**

1. To examine the effect of Corporate Social Responsibility on supply chain sustainability performance.
2. To analyze the influence of green leadership on sustainable supply chain operations.
3. To investigate the impact of sustainable finance on organizational sustainability performance.

## **Research Questions**

- Q1. How did Corporate Social Responsibility influence supply chain sustainability performance?  
Q2. What effect did green leadership produce on sustainable supply chain operations?  
Q3. How did sustainable finance contribute to organizational sustainability performance?

## **LITERATURE REVIEW**

### **Corporate Social Responsibility and Supply Chain Sustainability**

Corporate Social Responsibility (CSR) became an imperative strategy to enhance environmental responsibility and the sustainability of supply chains in industries performing around the world. CSR principles were adopted in sourcing, manufacturing, logistics and relations with suppliers to minimise environmental hazards and increase confidence of stakeholders. The research showed that CSR positively impacts green purchasing, eco-design and waste management, leading to improved performance of sustainability and operational efficiency in supply chains (Khan, 2022; Munir & Wang, 2021). Firms with effective "green" systems were able to deliver improved environmental status and more positive integration with consumer, supplier and regulatory stakeholders.

CSR also built organizational commitment in the manufacture and logistics industries for sourcing from an ethical perspective and sustainable use of resources. By promoting sustainable practice in the Supply Chain, companies were encouraged to reduce their carbon footprint, enhance labour standards and integrate environmental-friendly technologies within the operational systems. Studies in the field of social responsibility in supply chain management produced empirical evidence of its benefit in enhancing the organizations' competitiveness and its long-term sustainability by creating collaboration among the members of the supply chain (Duong et al., 2024; Zhang et al., 2025).

The inclusion of CSR in the Green Supply Chain Management further reinforced the environmental innovations and the transformation of the organization towards sustainability. Organizations that integrated CSR-based sustainability initiatives focused on investing in cleaner production systems, sustainable packaging and green procurement processes to reinforce their operational resilience and environmental impact. The researchers found that CSR had a positive impact on sustainable product development and reverse logistics practices, which helped to improve the efficiency of the supply chain and its ecological footprint (Lodhi et al., 2025; Raza et al., 2021). With the increased relevance of environmental governance, CSR was integrated into sustainability and supply chain management policies. Therefore, with the growing importance of

Environmental Governance, CSR was embedded in the general policies of sustainability and supply chain management of organisations.

### **Green Leadership and Sustainable Organizational Performance**

Green leadership was prominently featured in fostering environmental responsibility and cultivating an environmental friendly organizational culture in modern supply chains. Leaders modeled and influenced employees' behaviors and commitment to the organization through environmentally friendly decision making, sustainability vision, and green innovation approaches. Abbas (2024) and Rana et al. (2026) showed that both transformational leadership and green servant leadership had a positive impact on the performance of sustainable supply chains, through increased employee involvement in environmental projects and resource optimization initiatives. Green leadership also helps increase organizational agility and innovation capacity in facing climate change and environmental uncertainties. Environmentally responsible leaders promoted firms to adopt eco-friendly operating policies, low-carbon technologies, and renewable energy systems to support firms' supply chain sustainability. Empirical studies indicated that the leadership's environment is significantly linked to green dynamic capabilities, environmental innovation and sustainable competitive advantage in manufacturing industries (Yu et al., 2026; Junejo et al., 2025).

Advocated for and encouraged green leadership, participation of employee and supply chain in environmental management and sustainability-based innovation activities. Implementation of eco-design, green buying and sustainable logistics management systems of the organization resulted in sustainable leadership practices that also enhanced the environmental performance of organizations. It was revealed that organizations with an environmentally oriented leadership were found to have better sustainability performance and better operational efficiency, than organizations without an environmentally oriented managerial commitment (Rubab et al., 2024; Khan et al., 2025).

### **Sustainable finance and Green Supply Chain Performance**

Sustainable finance emerged as an important consideration in terms of environmental sustainability and long-term supply chain resiliency. They are increasingly important as more organizations adopt more sustainable financial strategies to support green investments and green technologies and more systems have an environmental eye on their strategic approach to sustainability. Financial strategies that are sustainable and timely are gaining ground in significance as the organizations that embrace them become more important in order to support green investments, renewable energy technologies and an environmentally responsible operational system. This was achieved by the financial institutions/investors' encouragement of ESG-related practice through encouraging the use of green financing instruments and mechanisms of focus on sustainability in investments. The companies demonstrated that sustainable finance positively impacted their environmental performance, as well as their supply chain sustainability, by aiding them in funding initiatives related to green technologies and cleaner production processes (Okay et al., 2024; Liao et al., 2024).

The growing focus on sustainable finance within the supply chain also boosted organizations' competitiveness and efficiency. Investment in sustainable technologies led to the type of companies that lowered environmental costs, enhanced energy efficiency, and had long term financial benefits. Organizations were assisted in implementing low-carbon logistics systems and

eco-friendly production lines, as well as embracing sustainable procurement procedures, with the support of sustainable financial frameworks. It was proved that environmentally responsible financial investments had a positive effect on green innovation, operational resilience, and sustainability of supply chains in manufacturing and service companies (Awan et al., 2025; Paulraj et al., 2017).

Green investment policies facilitated companies to coherently align their economic goals and mainstream sustainability and stakeholder expectations into investment decisions. They came to understand that environmental compliance and sustainability performance of their business is improved through grasping the effective strategic investments in environmental sustainability schemes. As a result of strategic allocation of funds to the most efficient sustainable financing schemes, they achieved environmental compliance and improved their corporate sustainability performance. They saw that evidence showed that sustainable finance and green innovation efforts and good green governance also played a role in their organisations' supply chain sustainability and development (Raza et al., 2021; Abbas, 2024). Sustainable finance also played an important role in global supply chain systems' effectiveness regarding integrated sustainability frameworks.

### **Research Hypothesis**

**H1:** Corporate Social Responsibility has a significant positive effect on Supply Chain Sustainability Performance.

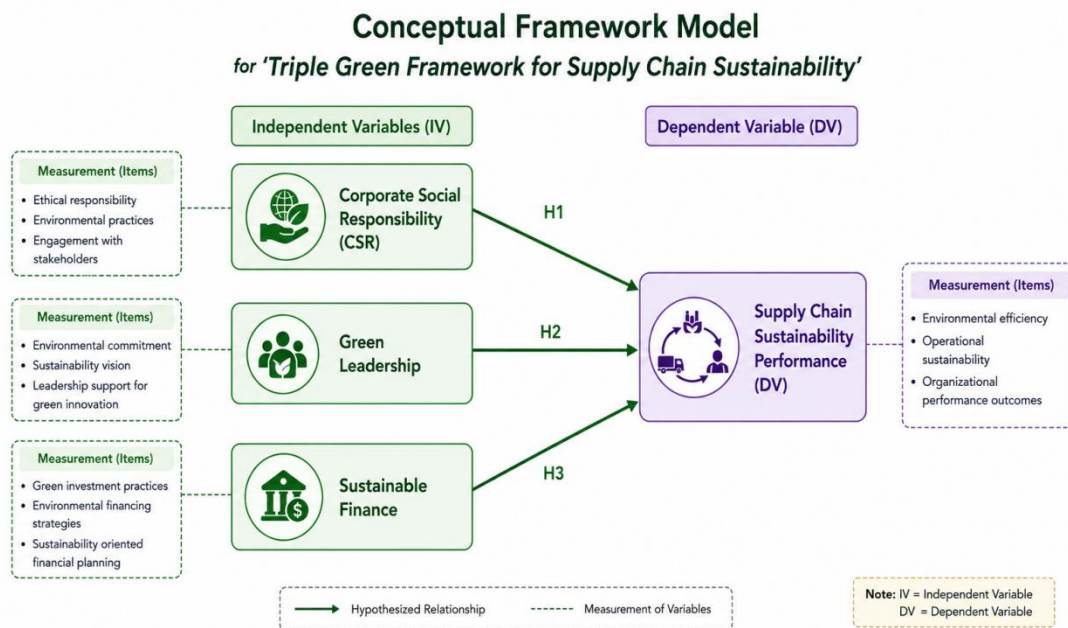
**H2:** Green Leadership has a significant positive effect on Supply Chain Sustainability Performance.

**H3:** Sustainable Finance has a significant positive effect on Supply Chain Sustainability Performance.

### **Conceptual Framework Model**

The conceptual framework model of triple green framework for supply chain sustainability was considered to understand how the factors of corporate social responsibility (CSR), green leadership and sustainable finance affect supply chain sustainability performance. The framework in the case of CSR was about ethics, stakeholder engagement and environmental practices, and the case of Green Leadership was about environmental commitment, sustainability vision, and leadership support for green innovation. Sustainable Finance examined greenhouse investment activities, environmental investment strategies and investments and financial planning for sustainability. The three independent variables were suggested to have a positive effect on the Dependent Variable, Supply Chain Sustainability Performance, evaluated based on three constructs: environmental efficiency, operational sustainability and organizational performance outcomes. The model proposed that socially responsible practices coupled with environmentally oriented leadership and b) sustainable financial strategies would have a significant impact on the sustainability performance of organizations and bring long-term competitive and environmental benefits to their supply chain operations.

Figure 1. Conceptual Framework Model



## RESEARCH METHODOLOGY

### Research Design

The study used a quantitative approach that focused on the impact of Corporate Social Responsibility (CSR), green leadership, and sustainable finance on the sustainability performance of supply chains. The quantitative approach was used to describe the relationships between the variables of the study quantitatively with statistical analysis. The cross sectional survey research method was used in the study because data were obtained from the respondents during a given time period. The research design allowed an objective analysis of the Triple Green Framework and how it can enhance the organizational sustainability performance in the supply chain.

### Populations in the Study

The target group included managers, supply chain professionals, financial officers, sustainability executives as well as members of the manufacturing and logistics areas. The primary focus of the study was to focus on those companies that are engaged in the process of conducting sustainability practices in their supply chain activities. Professionals were selected as respondents to ensure their active participation in areas related to the field of sustainability including procurement, production management, environmental compliance, logistics coordination and financial planning to have directly encountered activities in the field of sustainability. The representative population provided information on CSR initiatives, Leadership strategies for sustainability and Sustainable financial practice.

## **Sample Size and Sampling Techniques**

A sample of 320 manufacturing and logistics companies were used in this study. The sample size was sufficient for statistically testing the samples and their composed hypotheses. Purposive sampling technique was used as it is a study of the subjects directly involved in the sustainability activity and supply chain activity. The people who were selected as respondents were people who had experienced in their profession, as well as actively participating in the organisations in regard to green supply chain practices. The sampling technique ensured that obtained information gave insightful views on sustainability efforts and organizational performance.

## **Data Collection Method**

The primary data was collected through distributing the structured questionnaire to both manufacturing and logistics organizations. There were closed questions on a scale of strongly disagree to strongly agree on the questionnaire. This instrument included the measurement of CSR practices, green leadership, sustainable finance and sustainability performance of the supply chain. To maximize response rates questionnaires were sent out in both an online manner and using offline methods. The questionnaires were answered voluntarily and information was kept confidential all through the data gathering.

## **Measurement of Variables**

A single dependent variable (DV) and three independent variables (IV) were used in the study. The independent variables were the CSR integration, green leadership and sustainable finance, while the dependent variable was the performance of the supply chain in terms of sustainability. The questionnaire items were drawn from the published research of sustainability management, and from literature regarding green supply chain. The components covered in CSR included stakeholder engagement, environmental practices and ethical responsibility. The measures measuring green leadership involved: environmental commitment, sustainability vision, and green innovation support from leadership. The products eligible for the award, which were separated into two categories—green investment practices and environmental financing strategies and sustainability oriented financial planning—were judged by experts. The items eligible for the awards were divided into two categories: (1) green investment practices and (2) environmental financing strategies and sustainability oriented financial planning, which are judged by experts. The sustainability measures taken in the chain were measured in terms of environmental efficiency, operational sustainability and performance of the organization.

## **Data Analysis Techniques**

Data collected were then analyzed statistically with SPSS and SEM techniques. Descriptive Statistics: Mean, Standard deviation, Frequency and Percentage were used to summarize information related to demographic and variables. The measurement scales were analysed for internal consistency by means of a reliability analysis (Cronbach's alpha). The correlation analysis was performed to investigate the correlations between the study variables. The Hypotheses were tested by using regression analysis and SEM. The regression analysis and structural equation modeling (SEM) were used for testing the proposed hypotheses and identifying the effect of CSR, green leadership and sustainable finance on the supply chain sustainable performance. The



findings of the statistical analysis and their results provided empirical evidence of the effectiveness of the Triple Green Framework in comparison with the results of organizational sustainability.

## RESULTS AND ANALYSIS

### Demographic Analysis

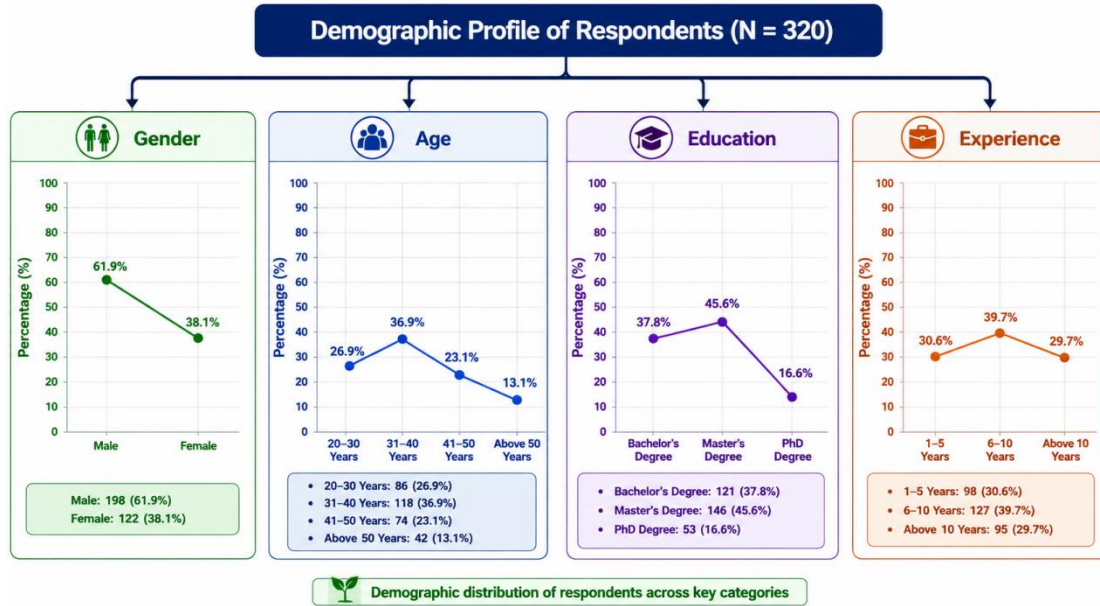
The demographic analysis examined the background characteristics of respondents participating in the study. The analysis included gender, age, educational qualification, and professional experience of employees working in manufacturing and logistics firms.

**Table 1. Demographic Profile of Respondents (N = 320)**

| Demographic Variable | Category          | Frequency | Percentage (%) |
|----------------------|-------------------|-----------|----------------|
| Gender               | Male              | 198       | 61.9           |
|                      | Female            | 122       | 38.1           |
| Age                  | 20–30 Years       | 86        | 26.9           |
|                      | 31–40 Years       | 118       | 36.9           |
|                      | 41–50 Years       | 74        | 23.1           |
|                      | Above 50 Years    | 42        | 13.1           |
|                      |                   |           |                |
| Education            | Bachelor's Degree | 121       | 37.8           |
|                      | Master's Degree   | 146       | 45.6           |
|                      | PhD Degree        | 53        | 16.6           |
| Experience           | 1–5 Years         | 98        | 30.6           |
|                      | 6–10 Years        | 127       | 39.7           |
|                      | Above 10 Years    | 95        | 29.7           |

The demographic results showed that males participated in the study in majority of 61.9% and females 38.1% of the total sample of the study. The findings indicated that sustainability and supply chain management positions have more male professionals in manufacturing and logistics. The age distribution revealed that the highest number of participants was aged 31-40 (36.9%) and secondly was the age group of 20-30 years (26.9%). The results indicated that middle age working professionals actively engaged in sustainability-related operational activities of organizations due to their practical experience in industries and managerial positions related to green supply chain management. The youngest (aged over 50 years) represented the smallest share, as they were increasingly being involved in sustainability transformation and environmental management processes. It is observed that 45.6% of respondents possessed master's degree as educational qualification, 37.8% had bachelor's degree and 16.6% had doctorate degree. The results showed that the respondents had a good educational level to grasp the sustainability frame and environmental management systems. These findings also validated the reliability of the answers provided on CSR practices, sustainable finance and green leadership in the organization's supply chain, given their professional experiences has a median duration of 6–10 years, corresponding to 39.7% of the participants.

Figure 2. Demographic Profile of Respondents (N = 320)



## Descriptive Statistics Analysis

Descriptive statistics analysis evaluated the mean and standard deviation values of the study variables to examine respondent perceptions regarding Corporate Social Responsibility, green leadership, sustainable finance, and supply chain sustainability performance.

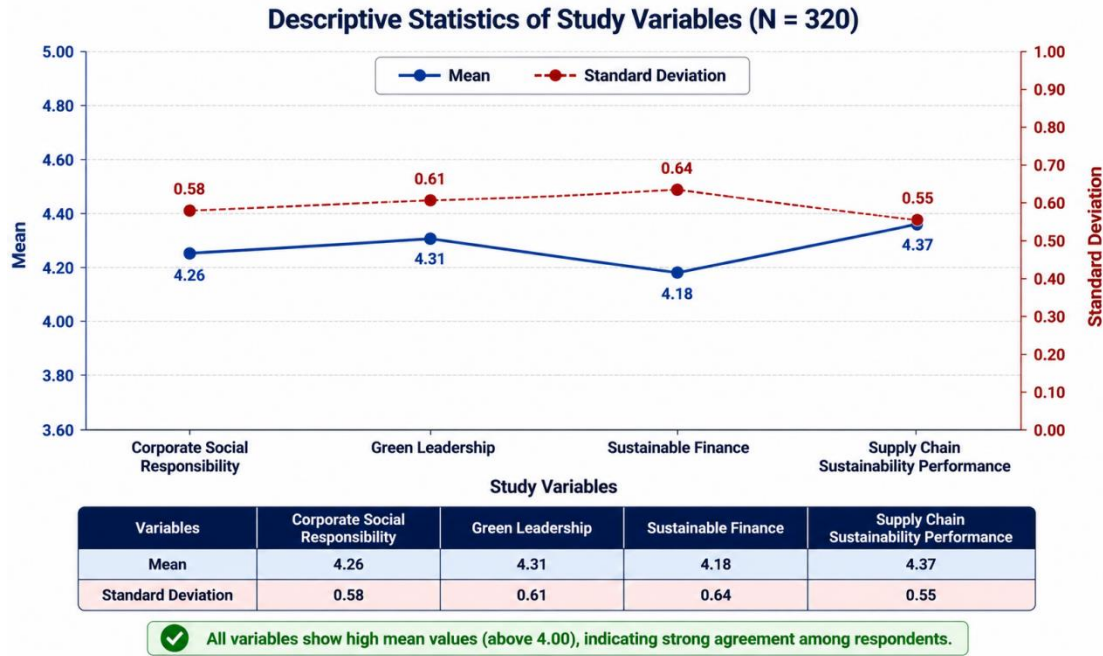
Table 2. Descriptive Statistics of Study Variables

| Variables                               | Mean | Standard Deviation |
|-----------------------------------------|------|--------------------|
| Corporate Social Responsibility         | 4.26 | 0.58               |
| Green Leadership                        | 4.31 | 0.61               |
| Sustainable Finance                     | 4.18 | 0.64               |
| Supply Chain Sustainability Performance | 4.37 | 0.55               |

The descriptive statistics revealed that all items in the study had high mean scores (above 4.00) pointing to a high consent among the respondents towards the implementation of sustainability practices in their organizations. The mean score for supply chain sustainability performance was 4.37, indicating that the respondents believe sustainability programmes are very effective in enhancing operational efficiency, environmental stewardship and competitiveness of their organizations. The mean score for green leadership was 4.31 and the standard deviation was 0.61, suggesting that organizational leaders supported green leadership and green innovation practices. The results showed that leadership commitment played a significant role in shaping the sustainability culture in the organization and employees' involvement in environmental-friendly operational activities. Similarly high mean values were obtained for the corporate social responsibility (CSR) and sustainable finance (4.26 and 4.18 respectively). The results indicated

that organisations successfully integrated ethical responsibility and sustainable financial strategies into their supply chain management operations. The low standard deviation values suggested uniformity in perceptions among respondents of sustainability practices and environmental management systems between manufacturing and logistics firms.

Figure 3. Descriptive Statistics of Study Variables



## Correlation Analysis

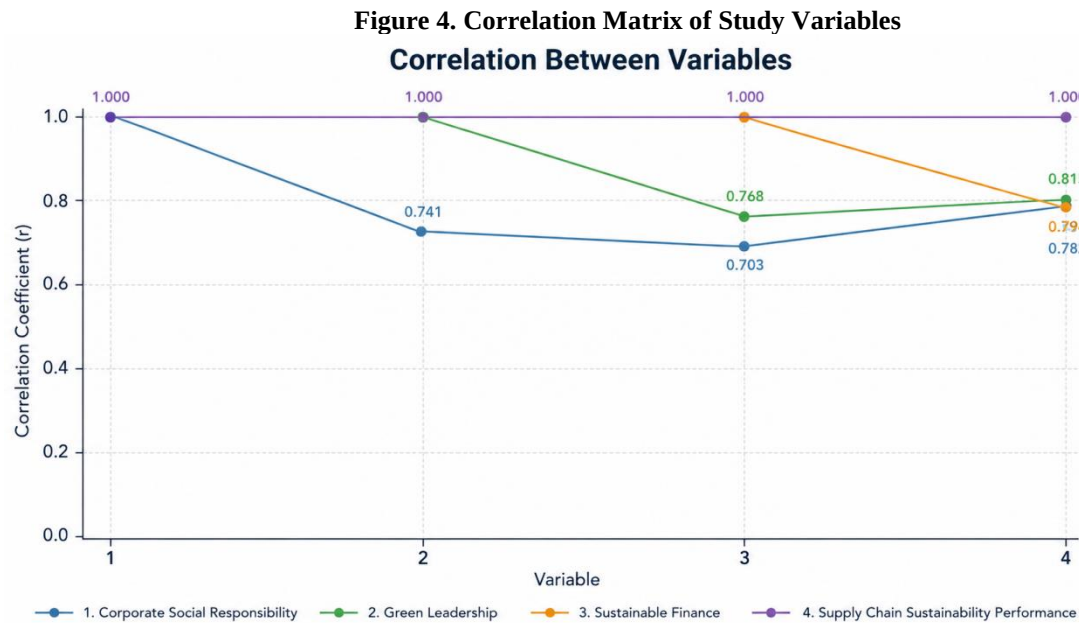
Correlation analysis examined the strength and direction of relationships among Corporate Social Responsibility, green leadership, sustainable finance, and supply chain sustainability performance.

Table 3. Correlation Matrix of Study Variables

| Variables                                  | 1     | 2     | 3     | 4 |
|--------------------------------------------|-------|-------|-------|---|
| 1. Corporate Social Responsibility         | 1     |       |       |   |
| 2. Green Leadership                        | 0.741 | 1     |       |   |
| 3. Sustainable Finance                     | 0.703 | 0.768 | 1     |   |
| 4. Supply Chain Sustainability Performance | 0.782 | 0.815 | 0.794 | 1 |

The correlation results indicated high positive correlation among all the variables of the present study. The results indicated that there was a significant positive correlation between the corporate social responsibility and the supply chain sustainability performance ( $r = 0.782$ ), meaning that the organizations that had practiced ethics, and were responsible for the environment and

surroundings, obtained better performances, sustainability and operational efficiency in the supply chain systems. The strong positive relationship between green leadership and supply chain sustainability performance ( $r = 0.815$ ) was the highest correlation coefficient strength among the independent variables. The results indicated that environmentally responsible leadership practices had a significant effect on the environmentally responsible organizational transformation and environmental performance. Sustainable finance had a good positive correlation with the sustainable performance in the supply chain ( $r = 0.794$ ), indicating that investments in sustainable finance positively contributed to performance in sustainable and resilient operations. The results showed that practices of environmental financial planning and investments increased the capability of environmental organizations to implement sustainable technologies and an environmental system.



## Regression Analysis

Regression analysis examined the impact of Corporate Social Responsibility, green leadership, and sustainable finance on supply chain sustainability performance.

**Table 4. Regression Analysis**

| Variables                                                                 | Beta ( $\beta$ ) | t-value | p-value |
|---------------------------------------------------------------------------|------------------|---------|---------|
| Corporate Social Responsibility → Supply Chain Sustainability Performance | 0.71             | 14.86   | 0.000   |
| Green Leadership → Supply Chain Sustainability Performance                | 0.68             | 13.42   | 0.000   |
| Sustainable Finance → Supply Chain Sustainability Performance             | 0.74             | 15.21   | 0.000   |

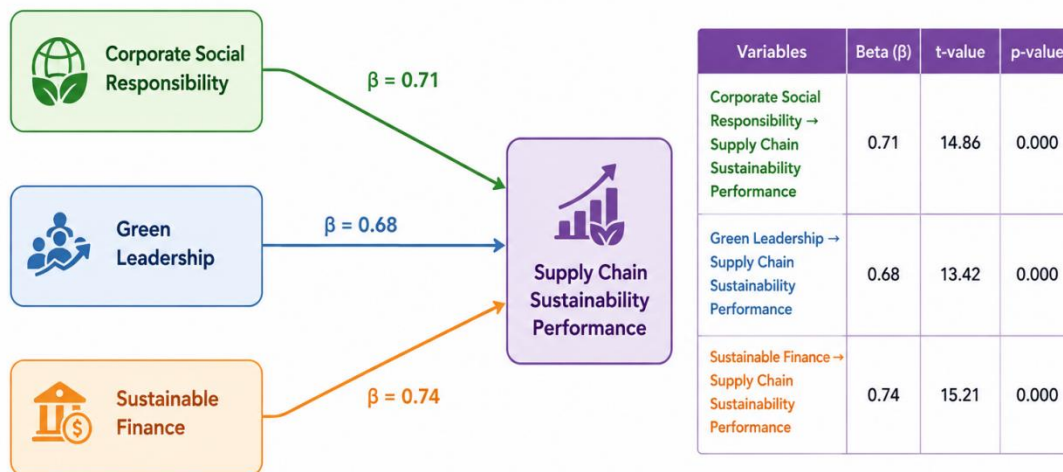
Table 5. Model Summary

| Model Statistics        | Value |
|-------------------------|-------|
| R                       | 0.842 |
| R <sup>2</sup>          | 0.709 |
| Adjusted R <sup>2</sup> | 0.704 |

The regression results showed the influence of Corporate Social Responsibility on supply chain sustainability performance was significant with a value of  $p = 0.000$ ,  $\beta = 0.71$ . The findings revealed that companies that established CSR practices had improved their environmental responsibility, the confidence of their stakeholders, and their operational efficiency in a sustainable manner by investing in their supply chain systems. Green leadership also had a significant positive impact on the sustainability performance of the supply chain with  $\beta = 0.68$  and  $p = 0.000$ . The results indicated that there was a positive relationship among leadership commitment for environmental sustainability, employee participation, green innovation and environmentally responsible operational behavior. Those organizations that had sustainable leaders had better sustainability results as leaders fostered a sustainable organizational culture and strategic environmental management practices. Sustainable finance had the highest effect on the sustainable performance of the supply chain with  $\beta = 0.74$  and  $p = 0.000$ . The results revealed that environmental-oriented financial investments and green financing mechanisms had a positive impact on enhancing the capacity of the organizations to adopt sustainable technologies and operational systems. The model summary showed that the overall variance in the level of sustainability performances of supply chains was explained by 70.9% of the model's total variance with the combined effects of CSR, green leadership, and sustainable finance.

Figure 5. Regression Analysis

### Structural Model: Predictors of Supply Chain Sustainability Performance



Note: All paths are statistically significant at  $p < 0.001$ .

## DISCUSSION

The results showed that there were significant positive effects on the sustainability performance of supply chains in manufacturing logistics companies that adopted Corporate Social Responsibility (CSR), green leadership and sustainable finance. The results showed that the organizations having operational strategies that focus on environmentally responsible and ethically good ones had more environmental efficiency, better levels of trust among their stakeholders and have better organizational competitiveness. This positive association between CSR and performance of the supply chain showed that socially responsible systems of operations improved the environmental governance and utilization of resources. The results confirmed the argument of CSR practices that promoted environmental compliance, operational transparency, and stakeholder engagement in sustainable supply chain systems, which were found by Yumei et al., (2021), and Wang et al., (2023).

The results of the study also demonstrated that green leadership positively affected supply chain sustainability performance by creating an organizational culture oriented towards sustainability and by implementing environmentally-friendly management. The leaders supported the employees to become green innovators and green mindset through direction and organization. The results indicated that leadership commitment had a positive effect to building employee engagement in environmental management activities and organizational adaptability towards environmental sustainability transformation. In similar research, it was concluded that green transformational leadership had a positive impact on the environmental innovation capacity and the operational efficiency of organizations focusing on sustainable operation (Zhang et al., 2024; Afsar et al., 2020).

The study results showed that sustainable finance was the most powerful factor to predict the sustainability performance of supply chains. The organizations that used green financing strategies and investment machines of an eco-friendly nature have made better efforts for their operational sustainability and technological innovations. Sustainable finance enabled businesses to invest in renewable energy technologies, green manufacturing systems and low carbon-based logistics processes that improved environmental and economic outcomes. The results were also consistent with the previous research that found sustainable financial investment contributed to bolstering green innovation capacity and supply chain resilience in industries that are sensitive to environmental impacts (Li et al., 2024; Kumar et al., 2023).

CSR was shown to have strong positive correlation with green leadership, sustainable finance and supply chain sustainability performance in the correlation analysis. These results indicated that there was a lack of independence of sustainability-related organizational practices. Companies with more sustainable practices overall performed better than companies with sustainable practices limited to one area of sustainability. Companies that had integrated ethical governance, leadership commitment and environmentally responsible financial plans had the best results for sustainability outcomes overall, compared to those that had limited sustainability efforts to one area of sustainability. As mentioned earlier, there were also some findings that consolidated sustainability framework increased the environmental performance, optimization of resources, and competitiveness of organizations through achieving coordinated sustainability practices (Gholami et al., 2022; Rehman et al., 2023).

The substantial impact of CSR on supply chain sustainability performance was an indication of the increasing significance of stakeholder expectations and environmental responsibility of companies in business environments. There was growing awareness among organisations of the demand of consumers, investors, governments and communities for systems of operation which

are sustainable and transparent. The results indicated that companies which practised CSR practices have minimized the environmental risks and enhanced their organizational reputation with responsible supply chain activities. Previous research also concluded that the CSR has a positive impact on green procurement (Naseem et al., 2020), on sustainable procurement (Testa et al., 2018), and on the efficiency of environmental management (Naseem et al., 2020), thus corroborating the above findings.

The positive impact of green leadership highlighted the strategic role of green leadership in sustainability performance and the innovation of the organization. Green leaders promoted joint efforts for a green environment and urged staff to take part in activities relating to an environment-friendly operation. Study results indicated that organizational environmental learning and decision making with environmental objectives were improved by the support of leadership. Empirical study results also showed that environmental commitment leaders promoted sustainable culture in organizations, and enhanced green innovation performance (Jiang et al., 2023; Singh et al., 2020). The results regarding sustainable finance showed that policies that aim at environmental considerations were positively connected to the ability of the organizations to invest in sustainable systems and technologies. Sustainable finance companies achieved higher level of resource efficiency, environmental innovation, and operational resilience by adopting a strategy of financing green investments. Sustainable finance also helped firms to improve their ability to meet environmental regulation and sustainability standards. The previous study also indicated that green financing mechanisms positively affected the environmental sustainability and green supply chain efficiency in the industrial sector (Chen & Xie, 2022; Rasool et al., 2024). These results showed that financial sustainability was a key element in driving organizational transformation and competitiveness in the process of becoming environmentally responsible.

The results of the regression model showed that the three variables – CSR, green leadership and sustainable finance – accounted for a significant amount of variance in supply chain sustainability performance. This finding was consistent with the theoretical significance of the Triple Green Framework to the study of organizational behavior in relation to sustainability. Companies with a holistic approach to sustainability systems, which embed ethical responsibility, environmentally committed leadership and sustainable investment systems, had better environmental and operational results than companies without integrated sustainability systems. Previous research also highlighted that multidimensional sustainability approach enhances supply chain network's adaptability, innovation capability and environmental performance (Longoni & Cagliano, 2018; Shahzad et al., 2023). The study results indicated that the companies that executed sustainability practices had a better organizational legitimacy and their market positioning was better in the business environment that had environmental considerations. In line with that, other research has found that sustainable supply chain management improved business sustainability for the long-term, environmental responsibility, and the economy's resilience (Benzidia et al., 2021; Khan et al., 2023). This study further confirmed the importance of integrated sustainability frameworks in achieving sustainable organizational performance and environmental competitiveness.

## **CONCLUSION**

The study found that the Triple Green Framework proved to be a significant contributing factor to the enhancement of the performance of a supply chain with the interplay of Corporate Social Responsibility (CSR), green leadership and sustainable finance. The conclusions showed that the organizations operating systems that have been developed in an environment friendly approach showed higher environmental efficiency, organizational resilience, and sustainable competitive

advantage. Both CSR and green leadership had a positive impact on stakeholder trust, ethical governance, and operations of the organizations' supply chains. Stakeholder trust, ethical governance, and environmentally sustainable operations of the supply chain were positively affected by CSR, whereas green leadership improved the sustainability-oriented culture and environmental commitment of the employees. Sustainable finance was again identified as the best predictor of supply chain sustainability performance, as financing sustainable operational systems and green technologies improved the sustainability capability of an organization. The regression results showed that CSR ( $\beta = 0.71$ ), green leadership ( $\beta = 0.68$ ) and sustainable finance ( $\beta = 0.74$ ) all had significant positive impact on SCSP, and the regression model accounted for 70.9% of the variance in sustainability outcomes ( $R^2 = 0.709$ ). Thus, the study validated that the implementation of integrated sustainability practices can enhance the organizational performance and contribute to long-term environmental and economic sustainability in manufacturing/logistics industries.

## **Recommendations**

The study suggested that the organizations should enhance their Corporate Social Responsibility practices and continuously incorporate environment accountability, ethical sourcing, sustainable procurement systems into their Supply chain practices. Firms need to establish explicit sustainability policies and establish transparency of environmental management activities to enhance stakeholder trust and organization legitimacy. The study also suggested that there is a need for leadership development training that emphasize environmental sustainability and green innovation as leadership commitment contributed strongly to sustainable operational performance. There should be encouragement of staff involvement in sustainability projects and promotion of staff awareness of sustainable organisational culture through training and awareness programmes for staff. Sustainable financing should be scaled up and advanced by financing renewable energy technologies, green production systems and environmentally responsible transportation systems and infrastructure. Governments and financial institutions need to offer financial incentives, green financing opportunities and policy support for companies to promote long-term sustainable transformation and, in particular, operational resilience.

## **Future Directions**

Future studies need to analyze the Triple Green Framework in a variety of production sectors and geographic areas to increase the generalizability of sustainability results. Comparative research between developed and developing economy can lead to more insights into the impact of institutional, cultural and regulatory aspects on sustainable supply chain performance. Other variables should be explored with future studies in the context of mediating or moderating factors in sustainability frameworks, including green innovation, digital transformation, environmental governance and circular economy practices. Long term research designs can also be used to evaluate long term sustainability results, or organisational change over time. Moreover, research and studies can employ mixed research methods with both quantitative and qualitative methodologies, to gain a more comprehensive grasp about the promotion of global supply chain sustainability with respect to managerial behavior, stakeholder participation and decision making processes.



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