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The Influence of Environmental and Social Sustainable Development Goals on Financial Performance with Green Innovation as a Moderating Variable in Banking Companies on the Indonesia Stock Exchange

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A B S T R A C T

Examining the effects of the social and environmentally Sustainable Development Goals (SDGs) on the financial performance of banks listed on the Indonesia Stock Exchange between 2019 and 2023 is the aim of this study. The role of green innovation as a mediator in the relationship between financial performance and SDG disclosure is also examined in this study. The research sample, which included 23 companies, was chosen through the technique of purposeful sampling. Moderated Regression Analysis (MRA) is used in this study. The findings show that while environmental SDGs have a detrimental effect on financial performance, social SDGs have no discernible effect. Financial performance is also negatively impacted by green innovation. Furthermore, the results show that green innovation and sustainability practices need to be managed well in order to improve banking organizations' financial success. Additionally, our results show that social SDGs positively and considerably modify the association between financial success and SDGs, but green innovation significantly and negatively moderates the relationship between financial performance and environmental SDGs

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INTRODUCTION

The global financial sector is undergoing a major transformation due to increased awareness of sustainability and climate change issues. According to the World Economic Forum (2023), investment in the green economy is expected to reach $103 trillion by 2030, with the financial sector playing an important role in capital allocation. In Indonesia, this phenomenon is reflected in the rise of sustainable financing. Anggi Ariesta (2024) states that "OJK noted that the realization of sustainable and green credit disbursement by the banking industry reached Rp1,959 trillion in 2023." This emphasizes the importance of green innovation and sustainability in financial operations.

Financial performance is the main indicator of the company's success in managing resources in a sustainable manner, which can be measured through return on assets (ROA). According to Kasmir (2021), ROA measures the efficiency of a company in using its assets to generate profits, the higher the ROA, the better the financial performance.

One of the factors that affect financial performance is the environmental SDGs, namely the implementation of environmentally friendly policies. OECD (2022) states that the environmental SDGs emphasize the transition to a green economy. Khan et al. (2022) and Saha et al. (2024) found a positive and significant effect of SDGs on financial performance. However, different results were shown by Lassala et al. (2021) and Setiawati & Taufiq (2023), which show that the integration of SDGs has not always had a positive impact.

In addition to environmental aspects, social SDGs are also important because they are related to stakeholder relations and corporate reputation. OECD (2022) states that social aspects include gender equality, education, and health. Arnanda (2024), Ramadhan (2024), and Iqbal & Safia (2023) found a positive influence of social SDGs on financial performance. In contrast, Wardan and Amalia (2024) found a negative effect on mining companies.

Green innovation serves as a moderating factor in attaining the best possible financial performance. The creation of ecologically friendly goods, procedures, and technology is a component of green innovation, according to Khan et al. (2022). Although Zhao et al. (2023) conclude that the connection is not always linear, research by Khan et al. (2022) demonstrates that green innovation increases the association between SDGs and financial performance.

Firm characteristics such as size, age and risk also affect financial performance. Firm size, measured by equity or sales (Riyanto, 2019), is often positively related (Fitriyah et al., 2024; Shahfira & Nanu, 2021), although different results were shown by Bellen et al. (2025) and Estiasih et al. (2024).

Company age reflects stability and experience. Anwar (2019) states that the age of the company shows its ability to survive in the midst of economic dynamics. Research by Wibowo & Setianingtyas (2022) and Rundjan & Merry (2023) supports this, but is opposed by Mallinguh et al. (2020) and Kurniawan et al. (2022).

Corporate risk also affects financial performance. According to Fahmi (2019), risk includes financial, operational, and regulatory aspects, and is measured through the debt to equity ratio (DER). Silvan & Yahya (2024) and

Lumbantobing et al. (2020) showed a positive effect of DER, while Susilawati et al. (2022) and Tania et al. (2021) show the opposite result.

The purpose of this study is to examine how the financial performance of banking businesses listed on the Indonesia Stock Exchange (IDX) for the years 2019–2023 is affected by the disclosure of environmental and social sustainable development goals (SDGs). Research gaps, empirical studies, and phenomenon descriptions are used in this process. This study also examines how green innovation functions as a moderating factor and takes into account control variables like risk, age, and company size. Giving a thorough understanding of the factors influencing banking financial performance in terms of sustainability is the aim of this study.

LITERATURE REVIEW

Theoritical Framework

Freeman's (1984) stakeholder theory states that companies are responsible to all stakeholders. Environmental and social SDGs reflect this responsibility, which can improve financial performance. Empirical support can be seen in Khan et al. (2022), Saha et al. (2024), Raimo et al. (2021), Ramadhan (2024), and Iqbal & Safia (2023), which demonstrate the positive impact of SDGs on financial performance. Green innovation as a moderator strengthens this relationship, as it supports efficiency and sustainability. Company size and company age support the adoption of SDGs, while high corporate risk may limit green investments.

Signaling theory from Spence (1973) explains that companies send positive signals through SDG disclosure and green innovation to reduce information asymmetry. Larger and more experienced companies are considered more credible, while corporate risk can weaken these signals. Studies by Albitar et al. (2022), Zhou et al. (2022), and Wang & Li (2022) demonstrate that sustainability signals enhance profitability and market value. The combination of stakeholder and signaling theory strengthens the understanding of the relationship between SDGs, green innovation, and financial performance.

Financial Performance

One way to measure how effective an organization's management is in generating profits is to look at its financial performance. The profitability ratio known as return on assets (ROA) is a way of determining how effective and efficient a business is in generating profits from all of its assets. Kasmir (2019) states that the value of active assets (ROA) indicates the rate of return generated by all assets over a certain period of time, and Fahmi (2019) states that ROA indicates the level of management effectiveness in generating profits from company assets.

Environmental SDGs

Environmental SDGs are sustainable development goals that focus on environmental issues such as resource management, climate change, and ecosystem conservation. UNEP (2022) states that these goals emphasize resource efficiency, reduction of environmental degradation, and resilience to the impacts of climate change. Harivelo et al. (2022) emphasize the importance of investing in environmental protection through carbon emission reduction, energy

efficiency, and waste management. The OECD (2022) adds that environmental SDGs support the transition to a green economy through the integration of climate action policies, biodiversity conservation, and pollution prevention.

Social SDGs

Part of sustainable development goals are the social Sustainable Development Goals (SDGs), which emphasize equal access to basic rights such as education, health, and decent work. According to UNDP (2022), the goal of social SDGs is to reduce poverty and inequality and build friendly and strong communities. Harvard University (2022) emphasizes that the social SDGs also include social cohesion, human security, and fair economic systems to ensure equal opportunities for all, and that the social aspects include gender equality, equitable education, and quality health services.

Green Innovation

Green innovation is innovation that aims to reduce negative impacts on the environment through environmentally friendly technologies and processes, balancing economic growth and environmental preservation. Li et al. (2022) define it as innovative activities to minimize environmental damage and improve resource efficiency with advanced technologies. Khan et al. (2022) emphasize that green innovation focuses on developing environmentally friendly products or services to encourage pro-environmental consumer behavior. Leal-Millán et al. (2022) add that green innovation also enhances a company's competitiveness through operational efficiency and strong relationships with suppliers amid environmental uncertainty.

Control Variable: Company size, company age and corporate risk

Company size is a measure of the size of a company that can be measured by total assets, sales, equity, or number of employees. Riyanto (2019) states that company size is measured by equity or sales value, while Setiyadi (2020) adds indicators such as assets and number of employees. Brigham and Houston (2021) emphasize that size is measured by average net sales over several periods. Company age refers to the length of time a company has been in existence, reflecting its experience and stability. Fuady (2019) mentions that age is calculated from the date the company was founded, while Anwar (2019) emphasizes its connection to credibility in the market, and Mulhadi (2019) links it to the maturity of the organizational structure. Corporate risk is the potential threat to business objectives, both from within and outside the company. Fahmi (2019) explains that this risk includes financial and operational risks, Fuady (2020) adds legal and market risks, and Kasmir (2021) emphasizes strategic risks triggered by economic dynamics and global policies.

Hypothesis Development

One key tactic in addressing the challenges on sustainability from around the world is the implementation of environmental SDGs including waste management, energy efficiency, and emission reduction. Investors and stakeholders are more likely to trust companies that implement environmental rules. According to signaling theory (Spence, 1973) and stakeholder theory (Freeman, 1984), environmental commitment is a positive signal to the market as well as a responsibility. Khan et al. (2022) and Saha et al. (2024) provide empirical evidence that the environmental SDGs significantly and favorably impact

financial performance. Consequently, long-term financial gains could result from investments in environmental sustainability.

H1: Environmental SDGs affect financial performance.

In addition to improving environmental factors, the Sustainable Development Goals (SDGs), which cover topics like gender equality, human rights, employee welfare, and corporate social responsibility (CSR), also boost a company's financial performance. Employers who focus on social issues typically have stronger bonds with their workforce and communities, which boosts output and builds loyalty. This supports the ideas of stakeholder theory (Freeman, 1984) and signaling theory (Spence, 1973), which contend that social responsibility sends a favorable signal to investors. The financial performance of Indonesian banks is positively impacted by SDG disclosure, which incorporates social components, according to studies by Arnanda (2024) and Ramadhan (2024).

H2: Social SDGs affect financial performance.

Green innovation encompasses the development of products, procedures, and management that take into account their effects on the environment. In the banking sector, this is evident in sustainable financing, effective resource management, and the development of long-lasting financial products. Investors concerned with sustainability are interested in green innovations that improve operational efficiency and reduce environmental costs. This can improve a business's financial performance. Studies by Khan et al. (2022) and Zhao et al. (2023) show that green innovation improves financial performance, although its effectiveness depends on a company's readiness and commitment to implementing.

H3: Green innovation affects financial performance.

In the context of sustainability, green innovation plays an important role in strengthening the influence of environmental SDGs on financial performance. These innovations include environmentally friendly technologies, products and business processes such as renewable energy, recycled materials and low-emission technologies. In addition to improving operational efficiency, green innovation also builds the company's image as an environmentally responsible entity. In accordance with stakeholder theory, green innovation increases stakeholder satisfaction, and according to signaling theory, provides a positive signal about the company's leadership in sustainability. Khan et al. (2022) proved that green innovation moderates the relationship between SDGs and financial performance by increasing efficiency and reducing environmental risks.

H4: Green innovation moderates the relationship between environmental SDGs and financial performance.

Green innovation controls the relationship between social Sustainable Development Goals (SDGs) and financial performance in addition to strengthening the relationship between environmental SDGs and financial performance. Integrate green innovation into social tactics like designing productive and healthful workplaces that draw top talent and boost productivity. This is consistent with signaling theory, which holds that investors value businesses' sustained commitment to sustainability through creative social

policies, and stakeholder theory, which holds that green social strategies foster partnerships with communities and consumers. Green innovation is essential for increasing the impact of social SDGs on financial success, citing research by Khan et al. (2022).

H5: Green innovation moderates the relationship between social SDGs and financial performance.

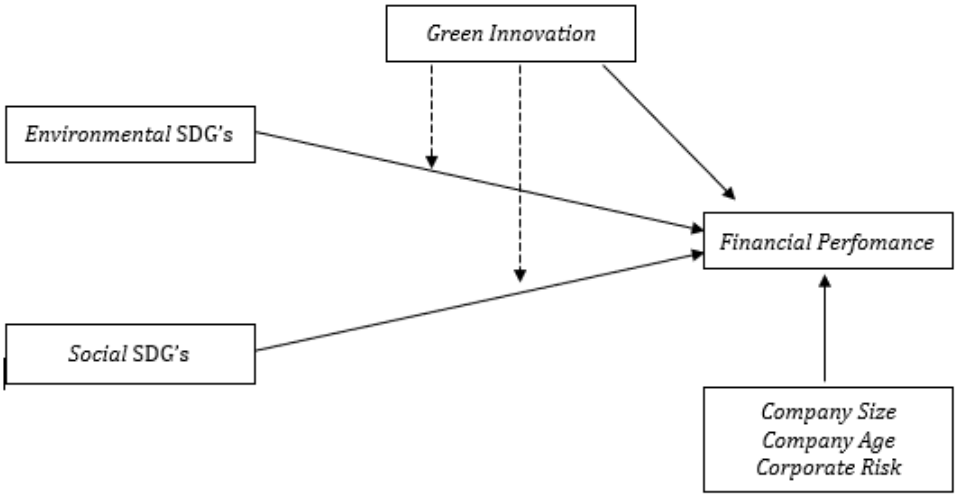

Figure 1. Conceptual Framework

METHODOLOGY

This research uses a quantitative approach, where according to Sugiyono (2019), data is presented in the form of numbers and analyzed statistically to test hypotheses. Secondary data in the form of audited financial statements and sustainability reports of banks listed on the IDX for the 2019-2023 period were obtained through the documentation method from the official IDX website (www.idx.co.id). Of the 46 banks, 23 were selected as samples using purposive sampling method. The type of data used is panel data, a combination of time series and cross section. Descriptive statistics are used to present data concisely through measures such as average, standard deviation, minimum and maximum values (Ghozali, 2018).

The analysis was conducted using Moderate Regression Analysis (MRA) on panel data to test the role of green innovation as a moderating variable in the relationship between environmental and social SDGs on financial performance. Tests were conducted through three models: the first model tested the direct effect of environmental and social SDGs along with controls; the second model tested the direct effect of green innovation; and the third model to see the moderating effect of green innovation (Hair et al., 2019).

RESULT AND DISCUSSION

Descriptive Statistical Analysis

Descriptive statistical analysis is used to comprehend the properties of the data prior to additional investigation. This comprises each variable's mean,

median, maximum, minimum, and standard deviation. The outcomes of the descriptive analysis for every variable used in this study are displayed in the following table.

Table 1. Results of Descriptive Statistical Analysis

	Y	X_1	X_2	M	K_1	K_2	K_3
Mean	0.032609	0.488783	0.438225	0.498435	17.88470	52.69565	5.031030
Median	0.020000	0.490000	0.437500	0.490000	17.67000	52.00000	4.907082
Maximum	0.520000	0.740000	0.520833	0.700000	21.50000	128.0000	16.07858
Minimum	-0.080000	0.020000	0.395833	0.150000	12.28000	4.000000	0.240150
Std. Dev.	0.065776	0.075116	0.027585	0.075760	2.180409	28.72500	2.883445
Observations	115	115	115	115	115	115	115

Source: Processed data (2025)

Based on descriptive analysis, the average ROA of 3.26% indicates moderate and relatively consistent bank profitability. Disclosure of environmental SDGs averaged 48.87% and social SDGs averaged 43.82%, reflecting the growing attention to sustainability aspects although uneven. Green innovation has an average of 49.84%, signaling the emergence of green innovation initiatives in the banking sector. Control variables show that most banks are large and experienced institutions, while the high average enterprise risk reflects differences in funding strategies and the level of risk taken.

Regression Model Estimation Results

Equation I

There are three methods that can be used to perform panel estimation: common effects model (CEM), fixed effects model (FEM), and random effects model (REM). The first equation is used to examine how environmental and social SDGs directly impact financial performance.

1. Common Effect Model (CEM)

Table 2. Common Effect Model Test Results Equation I

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.209430	0.202834	5.962656	0.0000
X_1	-0.257979	0.057437	-4.491507	0.0000
X_2	-0.067886	0.132111	-0.513857	0.6087
K_1	-0.064121	0.011543	-5.554745	0.0000
K_2	0.002497	0.002820	0.885484	0.3783
K_3	-0.001147	0.003146	-0.364585	0.7163
R-squared			0.785954	
Adjusted R-squared			0.719526	
Prob. (F-Statistic)			0.000000	

Source: Processed data (2025)

2. Fixed Effect Model (FEM)

Table 3. Results of Fixed Effect Model Test Equation I

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.589344	0.073308	8.039306	0.0000
X_1	-0.116198	0.052058	-2.232106	0.0277
X_2	-0.158172	0.142021	-1.113723	0.2678
K_1	-0.026634	0.002205	-12.08069	0.0000
K_2	0.001098	0.000159	6.894782	0.0000
K_3	-0.002412	0.001486	-1.623558	0.1074
R-squared			0.627927	
Adjusted R-squared			0.610859	
Prob. (F-Statistic)			0.000000	

Source: Processed data (2025)

3. Random Effect Model (REM)

Table 4. Results of Random Effect Model Equation I Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.614978	0.070141	8.767702	0.0000
X_1	-0.166444	0.048694	-3.418129	0.0009
X_2	-0.114046	0.125495	-0.908769	0.3655
K_1	-0.027923	0.002525	-11.06017	0.0000
K_2	0.001121	0.000185	6.049990	0.0000
K_3	-0.002136	0.001605	-1.331397	0.1858
R-squared			0.543805	
Adjusted R-squared			0.522879	
Prob. (F-Statistic)			0.000000	

Source: Processed data (2025)

The results of Equation I analysis show that the environmental SDGs variable (X_1) has a significant effect on financial performance in all models (CEM, FEM, REM), with the strongest significance in the FEM model. In contrast, social SDGs (X_2) does not show a significant effect in all three models. The control variable firm size (K_1) is significant in all models, while firm age (K_2) is only significant in CEM and REM. Firm risk (K_3) is generally insignificant. The CEM model has the highest explanatory power (R-Squared) in explaining variations in financial performance, which is 78.59%, compared to FEM (62.79%) and REM (54.38%).

Equation II

The second equation tests the direct effect of environmental SDGs, social SDGs, and green innovation on financial performance with control variables.

1. Common Effect Model (CEM)

Table 5. Common Effect Model Test Results Equation II

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.239802	0.213631	5.803467	0.0000
X_1	-0.242138	0.066717	-3.629306	0.0005
X_2	-0.070224	0.132796	-0.528808	0.5983
M	-0.030635	0.064792	-0.472823	0.6375
K_1	-0.064554	0.011631	-5.549960	0.0000
K_2	0.002233	0.002887	0.773408	0.4414
K_3	-0.001181	0.003161	-0.373607	0.7096
R-squared			0.786509	
Adjusted R-squared			0.717001	
Prob. (F-Statistic)			0.000000	

Source: Processed data (2025)

2. Fixed Effect Model (FEM)

Table 6. Results of Fixed Effect Model Test Equation II

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.584969	0.074854	7.814846	0.0000
X_1	-0.128362	0.064480	-1.990707	0.0490
X_2	-0.157499	0.142623	-1.104302	0.2719
M	0.020355	0.063179	0.322186	0.7479
K_1	-0.026627	0.002214	-12.02738	0.0000
K_2	0.001092	0.000161	6.783240	0.0000
K_3	-0.002397	0.001493	-1.605873	0.1112
R-squared			0.628284	
Adjusted R-squared			0.607633	
Prob. (F-Statistic)			0.000000	

Source: Processed data (2025)

3. Random Effect Model (REM)

Table 7. Results of Random Effect Model Equation II Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.613564	0.072507	8.462103	0.0000
X_1	-0.179099	0.059451	-3.012536	0.0032
X_2	-0.110739	0.126373	-0.876284	0.3828
M	0.015932	0.057452	0.277302	0.7821
K_1	-0.028024	0.002598	-10.78807	0.0000
K_2	0.001120	0.000192	5.841195	0.0000
K_3	-0.002111	0.001640	-1.287173	0.2008
R-squared			0.537517	
Adjusted R-squared			0.511823	
Prob. (F-Statistic)			0.000000	

Source: Processed data (2025)

The results of Equation II analysis show that environmental SDGs (X_1) is significant in the FEM model, but weak in CEM and REM. Social SDGs (X_2) is again insignificant in all models. The moderating variable green innovation (M) has an insignificant p value in all three models, so its direct effect on financial performance cannot be proven strong. Company size (K_1) is consistently significant, while company age (K_2) is only significant in FEM, and company risk

(K_3) remains insignificant. The highest R-Squared value is found in FEM (62.82%), followed by CEM (78.65%) and REM (53.76%).

Equation III

The third equation investigates how environmental and social Sustainable Development Goals (SDGs) moderately affect financial performance.

1. Common Effect Model (CEM)

Table 8. Common Effect Model Test Results Equation III

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.805484	0.103130	7.810374	0.0000
X_1	-1.327887	0.027084	-49.02886	0.0000
X_2	0.214754	0.241472	0.889352	0.3758
M	-1.069799	0.199735	-5.356100	0.0000
X_1.M	2.825067	0.054003	52.31362	0.0000
X_2.M	-0.580903	0.466998	-1.243909	0.0163
K_1	-0.016341	0.000465	-35.15751	0.0000
K_2	0.000849	3.09E-05	27.51197	0.0000
K_3	-0.001555	0.000293	-5.307496	0.0000
R-squared			0.986887	
Adjusted R-squared			0.985909	
Prob. (F-Statistic)			0.000000	

Source: Processed data (2025)

2. Fixed Effect Model (FEM)

Table 9. Results of Fixed Effect Model Test Equation III

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.834488	0.140867	5.923958	0.0000
X_1	-1.339839	0.036366	-36.84328	0.0000
X_2	0.065862	0.292187	0.225411	0.8222
M	-1.225116	0.240381	-5.096555	0.0000
X_1.M	2.891513	0.078166	36.99211	0.0000
X_2.M	-0.292547	0.564888	-0.517885	0.0059
K_1	-0.016466	0.003058	-5.385362	0.0000
K_2	0.001591	0.000671	2.371383	0.0200
K_3	-0.000910	0.000736	-1.236762	0.2196
R-squared			0.988776	
Adjusted R-squared			0.984768	
Prob. (F-Statistic)			0.000000	

Source: Processed data (2025)

3. Random Effect Model (REM)

Table 10. Results of Random Effect Model Equation III Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.805484	0.103130	7.810374	0.0000
X_1	-1.327887	0.027084	-49.02886	0.0000
X_2	0.214754	0.241472	0.889352	0.3758
M	-1.069799	0.199735	-5.356100	0.0000
X_1.M	-0.016341	0.000465	-35.15751	0.0000
X_2.M	0.000849	3.09E-05	27.51197	0.0000
K_1	-0.001555	0.000293	-5.307496	0.0000
K_2	2.825067	0.054003	52.31362	0.0000
K_3	-0.580903	0.466998	-1.243909	0.2163
R-squared			0.986897	
Adjusted R-squared			0.985909	
Prob. (F-Statistic)			0.000000	

Source: Processed data (2025)

The results of the analysis of Equation III show that environmental SDGs (X_1) and green innovation (M) are significant in all models, indicating that both have a strong effect on the company's financial performance. In contrast, social SDGs (X_2) is again not significant. The interaction of X_1.M (environmental SDGs × green innovation) and X_2.M (social SDGs × green innovation) shows a significant effect in most models. All control variables-firm size (K_1), firm age (K_2), and firm risk (K_3)-are quite stable, especially firm size and age are significant across models. The R-Squared value is very high in all three models, especially REM (98.68%), indicating that almost all the variation in financial performance is explained by this model.

Model Selection Test

Equation I

The selection of the best model for panel data analysis was conducted through three stages of testing, namely the Chow test, the Hausman test, and the Lagrange multiplier (LM) test.

1. Uji Chow

Table 11. Results of Chow Test for Equation I

Effect Test	Statistic	d.f	Prob.
Cross-section F	2.919594	(22,87)	0.0002
Cross-section Chi-square	63.583586	22	0.0000

Source: Processed data (2025)

The Chow test results show a probability value of 0.0000 <0.05, so H_0 is rejected. This indicates that the fixed effect model is more appropriate than the common effect model.

2. Uji Hausman

The Hausman test was conducted after the Chow test, which showed that the fixed effects model was more appropriate than the random effects model. The results of the Hausman test are as follows:

Table 12. Results of Hausman Test Equation I

Effect Test	Chi-square	Chi-sq. d.f	Prob.
Cross-section random	24.119796	5	0.0002

Source: Processed data (2025)

The table displays a probability of 0.0002 < 0.05 and a chi-square value of 24.119796 with 5 degrees of freedom. This suggests that H0 is disproved. Thus, rather than using the random effects model, the fixed effects model is better suitable.

Equation II

Equation I shows the three testing stages used to select the best model for panel data analysis; the test results are shown in Equation II.

1. Uji Chow

Table 13. Results of Chow Test for Equation II

Effect Test	Statistic	d.f	Prob.
Cross-section F	2.897158	(22,86)	0.0002
Cross-section Chi-square	63.771668	22	0.0000

Source: Processed data (2025)

The table shows the Chow test results between the common effect model and the fixed effect model, where the chi-square probability value is 0.0000 <0.05. Therefore, H_0 is rejected and the fixed effect model is more appropriate.

2. Uji Hausman

Table 14. Results of Hausman Test Equation II

Effect Test	Chi-square	Chi-sq. d.f	Prob.
Cross-section random	23.526008	6	0.0006

Source: Processed data (2025)

Based on the table, the chi-square value is 23.526008 with 6 degrees of freedom and a probability of 0.0006 <0.05, so H_0 is rejected. In the context of the Hausman test, this indicates that the fixed effects model is more appropriate than the random effects model for this data analysis.

Equation III

Equations I and II show the three testing stages used to select the best model for panel data analysis; the test results for Equation III can be seen here.

1. Uji Chow

Table 15. Results of Chow Test for Equation III

Effect Test	Statistic	d.f	Prob.
Cross-section F	0.639249	(22,84)	0.8829
Cross-section Chi-square	17.801799	22	0.7177

Source: Processed data (2025)

The table shows the results of the Chow test comparing the common effect model and the fixed effect model. Based on the cross-section chi-square test value, the probability value is 0.7177, which is greater than 0.05, so the decision taken is not to reject H_0. This indicates that the common effect model is more appropriate than the fixed effect model.

2. Uji Hausman

Table 16. Results of Hausman Test Equation III

Effect Test	Chi-square	Chi-sq. d.f	Prob.
Cross-section random	5.776720	8	0.6722

Source: Processed data (2025)

The table shows a chi-square value of 5.776720 with 8 degrees of freedom, and a probability of 0.6722 greater than 0.05. Since H is not rejected in the Hausman test, the random effects model is more suitable for this analysis than the fixed effects model.

3. Uji Langrange Multiplier

Table 17. Results of Lagrange Multiplier Test Equation III

Statistik	Cross-section	Time	Both
Breusch-Pagan	2.809815	0.001253	2.811068
p-value	0.9532	0.9718	0.0936

Source: Processed data (2025)

Based on the table, the chi-square value (Breusch-Pagan) is 2.809815, and the p-value for the cross-section test is 0.9532. The random effects model is better than the fixed effects model because the chi-square technique and H0 are rejected.

Classical Assumption Test

Equations I, II, and III

Based on the results of estimation and model selection, equations I and II were analyzed using fixed effect model (FEM) with EGLS approach to accommodate unobserved heterogeneity and produce efficient estimation. Therefore, the classical assumption test is not the main focus as individual variations have been controlled in the panel structure (Gujarati & Porter, 2009). Meanwhile, equation III uses the random effect model (REM) which, according to Baltagi (2021), automatically corrects heteroscedasticity and autocorrelation through the GLS method. Wooldridge (2020) states that multicollinearity in REM does not cause bias, only increases estimation variance, and Hsiao (2019) asserts that classical assumptions are not mandatory in REM because residuals are heterogeneous between individuals. Thus, the classical assumption test is not carried out separately because it has been covered in the model approach used.

Goodness of Fit Test

Equations I

Assessing how well the regression model can account for the variance in the dependant variable is the goal of the goodness of fit test. The R-squared (R^2) and Adjusted R-squared values are two metrics that are employed; they show the percentage of the dependent variable's variability that can be accounted for by the independent variables in the model.

Table 18. Goodness of Fit Test Results for Equation I

Statistics	Value
R-squared	0.627927
Adjusted R-squared	0.610859
F-statistic	36.79064
Prob. (F-statistic)	0.000000

Source: Processed data (2025)

The model fit test in equation I shows that the independent variables account for approximately 62.79% of the variation in the dependent variable, according to the R-squared value of 0.627927 and the adjusted R-squared value of 0.610859. This indicates that, despite the model being adjusted for the number of variables present, the model's accuracy remains high. With an F-statistic value of 36.79064 and a probability of 0.000000, the model is considered statistically significant overall in explaining the relationship between the independent and dependent variables.

Equations II

A goodness-of-fit test was conducted to assess how well the regression model used in Equation II explained the variation in the dependent variable.

Table 19. Goodness of Fit Test Results for Equation II

Statistics	Value
R-squared	0.628284
Adjusted R-squared	0.607633
F-statistic	30.42409
Prob. (F-statistic)	0.000000

Source: Processed data (2025)

According to the table, Equation II's model fit test results reveal an R-squared value of 0.628284, meaning that around 62.82% of the variation in the dependent variable can be explained by the model. After controlling for the number of independent variables, the adjusted R-squared value of 0.607633 shows that roughly 60.76% of the variation can still be explained. Overall, the model's F-statistic value of 30.42409 and probability of 0.000000 indicate that it is important in explaining the dependent variable.

Equations III

The goodness of fit test in Equation III aims to assess the extent to which the regression model can explain the variation in the dependent variable.

Table 20. Goodness of Fit Test Results for Equation III

Statistics	Value
R-squared	0.986897
Adjusted R-squared	0.985909
F-statistic	997.9997
Prob. (F-statistic)	0.000000

Source: Processed data (2025)

With an R-squared value of 0.986897 and an adjusted R-squared value of 0.985909, the model fit test results for Equation III, as shown in the table, indicate that the model can explain roughly 98.68% of the variation in the dependent variable. This means that, after controlling for the number of variables, approximately 98.59% of the variation can still be explained. The F-statistic value of 997.9997 with a probability of 0.000000 shows that, overall, the model.

Hypothesis Test

Equations I

The hypothesis test in Equation I aims to analyze the effect of each independent variable on the dependent variable.

Table 21. Hypothesis Test Results Equation I

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.589344	0.073308	8.039306	0.0000
X_1	-0.116198	0.052058	-2.232106	0.0277
X_2	-0.158172	0.142021	-1.113723	0.2678
K_1	-0.026634	0.002205	-12.08069	0.0000
K_2	0.001098	0.000159	6.894782	0.0000
K_3	-0.002412	0.001486	-1.623558	0.1074

Source: Processed data (2025)

The model constant is significant, according to the findings of the hypothesis test, with a p-value of 0.0000. While social SDGs (X_2) have no discernible impact on financial performance ($p = 0.2678$), environmental SDGs (X_1)

have a negative and substantial impact (p = 0.0277). Financial performance is also significantly and negatively impacted by company size (K_1) (p = 0.0000), whereas financial performance is significantly and favorably impacted by company age (K_2) (p = 0.0000).

Equations II

To determine how independent and mediating variables affected dependent variables, hypothesis testing was done in Equation II.

Table 22. Hypothesis Test Results Equation II

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.584969	0.074854	7.814846	0.0000
X_1	-0.128362	0.064480	-1.990707	0.0490
X_2	-0.157499	0.142623	-1.104302	0.2719
M	0.020355	0.063179	0.322186	0.7479
K_1	-0.026627	0.002214	-12.02738	0.0000
K_2	0.001092	0.000161	6.783240	0.0000
K_3	-0.002397	0.001493	-1.605873	0.1112

Source: Processed data (2025)

The results of the hypothesis test for this model show that the constant has a substantial impact, with a p-value of 0.0000. Financial performance is significantly impacted negatively by the environmentally Sustainable Development Goals (SDGs) (X_1) (p = 0.0490), but not significantly by the social SDGs (X_2) (p = 0.2719). The impact of firm age (K_2) is positive and significant (p = 0.0000), but the impact of company size (K_1) is negative and significant (p = 0.0000). The impact of corporate risk (K_3) is negligible.

Equations III

By taking into account the link between the independent and mediating variables in Equation III, hypothesis testing was carried out. This test was designed to identify the variables that significantly impacted the model and to ascertain if the relationships between the variables enhanced or weakened their relationship with the dependent variable.

Table 23. Hypothesis Test Results Equation III

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.805484	0.103130	7.810374	0.0000
X_1	-1.327887	0.027084	-49.02886	0.0000
X_2	0.214754	0.241472	0.889352	0.3758
M	-1.069799	0.199735	-5.356100	0.0000
X_1.M	-0.016341	0.000465	-35.15751	0.0000
X_2.M	0.000849	3.09E-05	27.51197	0.0000
K_1	-0.001555	0.000293	-5.307496	0.0000
K_2	2.825067	0.054003	52.31362	0.0000
K_3	-0.580903	0.466998	-1.243909	0.2163

Source: Processed data (2025)

The results of the hypothesis test on the moderation model show a significant effect of the constant (p = 0.0000). Sustainable Development Goals (X_1) and green innovation (M) each have a negative and significant effect on financial performance (p = 0.0000), while Sustainable Development Goals (X2) social has no significant effect. The interaction between X1 and M (X_1.M) has a negative and

significant effect (p = 0.0000), while the interaction between X_2 and M (X_2.M) has a positive and significant effect (p = 0.3758). Company risk (K_3) does not have a significant impact on financial performance; company age (K_2) has a positive impact, and company size (K1) has a significant negative impact.

Research shows that environmentally Sustainable Development Goals (SDGs) significantly and negatively affect the financial performance of banking companies in Indonesia. This indicates that the level of corporate environmental disclosure is positively correlated with the impact of declining financial performance. These results support stakeholder theory, which states that companies have a social responsibility to all stakeholders. Additionally, these findings indicate that the costs associated with implementing environmental practices do not yield short-term economic benefits. According to research conducted by Lassala et al. (2021), companies that have not incorporated SDGs into their business strategies tend to have better historical financial performance.

Conversely, these findings contradict research conducted by Khan et al. (2022) and Saha et al. (2024), which shows that the implementation of environmentally Sustainable Development Goals (SDGs) can improve operational efficiency and support company performance. This discrepancy indicates that environmental disclosure does not yet fully drive banking financial performance in Indonesia.

The social Sustainable Development Goals (SDGs) do not have a significant impact on financial performance. The results show that corporate profits are not directly affected by their commitment to social issues such as gender equality, education, and health. According to the OECD (2022), social SDGs are an important component of sustainable development that can strengthen the relationship between businesses and their stakeholders.

This finding contradicts the results of research by Arnanda (2024), Ramadhan (2024), and Iqbal & Safia (2023), which state that disclosure of social SDGs has a positive influence on financial performance. This indicates a potential mismatch between stakeholder expectations and actual implementation in the social context in the Indonesian banking industry. In addition, sector differences can also be a reason, as shown by Wardan and Amalia (2024) who found that SDGs disclosure had a negative impact in the mining sector.

Interestingly, green innovation was found to have a negative and significant effect on financial performance. This means that companies that are more aggressive in conducting green innovation actually experience a decline in profitability in the short term. This may occur because investments in green technology often require large costs and a long time to reap the rewards. This finding supports signaling theory, where companies send positive signals to the market through green innovation, but the market has not fully responded financially.

This result is not in line with the research of Zhao et al. (2023), which states that green innovation can increase firm value in the eyes of investors. This indicates that although green innovation has strategic potential, its effectiveness is highly dependent on the readiness of internal systems and market response to sustainability initiatives.

Furthermore, green innovation moderates the effect of environmental SDGs on financial performance negatively and significantly. This means that when environmental disclosure is accompanied by green innovation, its impact on financial performance decreases. This finding suggests that the merger of the two sustainability strategies has not been followed by the effectiveness of mature implementation, both in terms of costs and strategic management. This result supports the findings of Khan et al. (2022) which highlight the importance of internal readiness in implementing green innovation as a strategy to support SDGs.

However, this moderation result also reinforces the view that the adoption of SDGs and green innovation does not always have a linear positive impact on financial performance. In many cases, companies still face challenges in integrating these two approaches synergistically.

Conversely, the impact of social Sustainable Development Goals (SDGs) is not greatly influenced by green innovation moderation. This shows that green innovation cannot increase the contribution of social elements to a company's financial performance. This may be because there is no direct relationship between social efforts and technological innovation, so the impact is not financially significant in the short term. In addition, the Indonesian banking sector has not yet understood and implemented green innovation and social elements.

In terms of control variables, company size has a significant and positive impact on financial performance; this indicates that larger businesses tend to have more resources that can be used to increase profits. This is consistent with research conducted by Fitriyah et al. (2024) and Shahfira & Nanu (2021). However, other studies, such as those conducted by Bellen et al. (2025) and Estiasih et al. (2024), state that company size does not always determine financial performance.

Furthermore, company age also has a positive and significant effect, which indicates that companies with more mature experience tend to have more stable financial performance. This supports Anwar's (2019) statement and Wibowo & Setianingtyas' (2022) research. However, different results were shown by Kurniawan et al. (2022) which states that company age cannot predict financial performance because experience is not necessarily in line with managerial efficiency.

Finally, company risk as measured by the debt-to-equity ratio has a positive and significant effect on financial performance. This means that effective use of debt can support the growth of corporate profits, in line with the findings of Silvan & Yahya (2024), and Lumbantobing et al. (2020). However, keep in mind that excessive use of debt can also pose additional risks, as suggested by Susilawati et al. (2022) and Tania et al. (2021) who found different results.

CONCLUSSION AND RECOMENDATION

The study concluded that the environmental SDGs negatively affect financial performance, suggesting that environmental sustainability efforts can be a short-term financial burden for banks. The social SDGs had no significant effect, indicating that social disclosure has not driven profitability. Green innovation acts as a quasi-moderator, has a direct negative influence, but strengthens the influence

of social SDGs and weakens the negative impact of environmental SDGs, thus demonstrating its complex role in aligning sustainability and profitability. The size of the company has a negative effect, while the age of the company has a positive effect; the risk of the company has no significant effect. The findings indicate that banks need to strategically integrate sustainability and innovation to improve long-term financial performance, while regulators are encouraged to provide supportive policies and incentives. Further research is suggested to explore other sectors and approaches to deepen understanding of the financial implications of sustainability.

FURTHER STUDY

While there are some limitations, this study provides important insights into how environmental and social Sustainable Development Goals (SDGs) affect financial performance, with green innovation as a moderating factor. Since this study only covers banking companies listed on the Indonesia Stock Exchange, the results may not be fully applicable to other sectors or countries with different regulations and practices. Additionally, the contextual and strategic aspects of sustainability practices are not fully addressed by the quantitative approach used. In addition, this study has not considered other factors that may be influential such as corporate governance, the intensity of stakeholder engagement, or the role of digital transformation in green innovation. Future studies are advised to extend the scope to non-financial sectors or conduct cross-country comparisons in order to gain more comprehensive insights. Mixed or qualitative approaches, such as interviews with sustainability managers, can also deepen understanding of SDGs implementation and innovation. Further research could also examine the role of government incentives and investor responses in moderating the relationship between sustainability and financial outcomes.

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