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The Influence of Green Operations on Sustainability Performance Through Service Quality in the Banking Industry

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Abstract

This study aims to examine and analyze the influence of Green Operations on Sustainability Performance through Service Quality in banking services. The population consists of employees of PT Bank Shinhan Indonesia, with a sample of 102 individuals selected via purposive sampling technique. Data analysis was conducted using Structural Equation Modeling with Partial Least Squares approach (SEM-PLS). The results reveal that Green Operations positively affect Service Quality, Service Quality positively influences Sustainability Performance, and Green Operations have a direct positive and significant impact on Sustainability Performance. Additionally, there is an indirect effect of Green Operations on Sustainability Performance through Service Quality, indicating that Service Quality acts as a partial mediating variable that strengthens the relationship between environmentally friendly operations and sustainable performance. This study contributes both practically and theoretically to the development of sustainable banking business practices.

Keywords: green operations, sustainability performance, service quality, SEM-PLS

1. Introduction

1.1 Introduction Problem

Stakeholders increasingly demand that companies prioritize social and environmental aspects, driving the adoption of eco-friendly operations to fulfill the triple bottom line encompassing profitability, people, and planet, as outlined in stakeholder theory (Kashi et al., 2024). In Indonesia's banking sector, this commitment is realized through OJK's sustainable finance roadmap since December 2014 and POJK No. 51/POJK.03/2017, which mandates financial institutions to prepare sustainability reports and implement green operations to mitigate environmental impacts via digitalization, energy savings, online banking, green loans, and green financing portfolios such as renewable energy and energy efficiency.

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The concept of green banking synonymous with green operations in banking is supported by four pillars: nature, well-being, economy, and society, along with principles to strengthen environmental risk management, expand eco-friendly financing portfolios, and facilitate a transition to sustainable economies, first developed in Western countries since (Zaputra R R A & Romli, 2021); (Dewi, 2023); (Mir & Bhat, 2022) Prior studies confirm that green operations enhance service quality, green financing, and bank sustainability performance through daily operational practices, policies, and employee involvement, though challenges like limited awareness in smaller banks and the mediating role of green finance warrant further exploration (Kumar et al., 2024); (Ratnasari et al., 2021); (Chen et al., 2022)

Sustainability performance is assessed via ESG factors environmental for ecological commitments, social for stakeholder relations, and governance for leadership and controls communicated through GRI Standards 2016-based reports that build stakeholder trust, minimize operational risks, and align with SDGs like Goal 13 on climate action (Arkaan et al., 2023); (Nusraningrum et al., 2023); (Akadiati et al., 2023). PT Bank Shinhan Indonesia, part of Korea's Shinhan Financial Group with assets of 198.7 trillion, equity of 10.76 trillion, 1,038 branches, and 15 million customers as of 2007, adopts global ESG standards, fintech, and digital services for environmentally friendly efficiency like paper reduction and mobile banking yet empirical studies specific to this bank remain scarce despite its competitive potential as a foreign player (Bank Shinhan, 2025).

Service quality serves as a critical bridge, where green operations boost customer satisfaction through service innovations while supporting SDGs and POJK regulations, with customer complaints often arising from dissatisfaction that can damage reputation (Rehan et al., 2025). This study addresses the gap by testing service quality mediation via SEM-PLS on 102 Bank Shinhan employees using purposive sampling, contributing insights into green operations in Indonesia's foreign banks and managerial implications for elevating sustainability performance.

1.2 Literature Review

1.2.1 Underlying Theoretical Framework

This study is grounded in Stakeholder Theory and the Triple Bottom Line (TBL) framework, which together provide a strong theoretical foundation for explaining the relationships between green operations, service quality, and sustainability performance in the banking industry.

Stakeholder Theory posits that organizations are responsible not only to shareholders but also to a wide range of stakeholders, including customers, employees, regulators, communities, and the environment (Kashi et al., 2024). In the banking context, the implementation of green operations reflects a strategic response to stakeholder expectations regarding environmental responsibility, ethical governance, and sustainable business practices. By adopting environmentally friendly operational activities such as digitalization, energy efficiency, and waste reduction, banks are able to enhance trust, legitimacy, and long-term relationships with stakeholders. Improved service quality serves as an important mechanism through which green operational practices

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translate into positive stakeholder perceptions and satisfaction, ultimately contributing to superior sustainability performance.

In addition, this study adopts the Triple Bottom Line (TBL) framework, which emphasizes that organizational performance should be evaluated based on three interrelated dimensions: economic, environmental, and social performance. Green operations directly contribute to the environmental dimension by reducing ecological impacts, while high service quality strengthens the social dimension through improved customer satisfaction, ethical service delivery, and stakeholder engagement. Together, these dimensions reinforce the economic sustainability of banking institutions by enhancing operational efficiency, reputation, and competitive advantage. Therefore, sustainability performance in this study is conceptualized as an integrated outcome resulting from environmentally responsible operations and superior service quality.

By integrating Stakeholder Theory and the Triple Bottom Line framework, this research provides a comprehensive theoretical explanation for how green operations influence sustainability performance both directly and indirectly through service quality. This theoretical integration supports the proposed research model and hypothesis development.

1.2.2 Sustainable Development Goals (SDGs)

Sustainable Development Goals (SDGs) form a global agenda for sustainable development across economic, social, and environmental dimensions, manifested as action plans for people, planet, prosperity, and peace. SDG targets integrate comprehensively, apply universally while accounting for national realities in capacity and development levels, and respect each country's policies and priorities. Thus, nations play crucial roles in holistic strategies balancing economic growth, social inclusion, and environmental sustainability while prioritizing national characteristics. SDGs encompass 17 goals and 169 targets from 2016 to 2030, addressing comprehensive development issues with complete resolution for each goal and target. This universality balances roles across developed, developing, and least-developed countries for full contribution, ensuring benefits for all under "no one left behind". Indonesia, having endorsed SDGs, commits strongly: in 2016, it mapped SDG goals/targets to national priorities, assessed data/indicator availability, defined operational indicators, issued Presidential Regulation No. 59/2017 on SDG Achievement Implementation, and prepared national/regional action plans. Most SDG goals/targets align with Indonesia's National Medium-Term Development Plan (RPJMN) 2015-2019: 57% or 96 of 169 targets match national priorities. Environmental pillars (Goals 6, 11-15) clean water/sanitation, sustainable cities/communities, responsible consumption/production, climate action, ocean ecosystems, terrestrial ecosystems are accommodated via water resilience, housing/settlements, climate/disaster management with national GHG reduction actions, maritime economy, natural resource/environmental conservation (SDA-LH)/disaster management, and biodiversity strategies. For SDG Goal 13 (urgent climate action), Indonesia integrates anticipatory measures into national policies/strategies/plans via Biennial Update Reports (BUR) updating national GHG inventories, adaptation/mitigation strategies, and international climate achievements. GHG reduction reports reflect central/regional actions in forestry/peatlands, agriculture, energy/transport, industry, and

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waste (BPS, 2021).

1.2.3 Green Operations

Green operations involve business approaches that minimize environmental impacts through eco-friendly practices across all operational processes, from procurement to waste disposal (Thomas et al., 2022). Primary goals include environmental impact reduction (minimizing GHG emissions, waste, non-renewable resources), efficiency gains (optimizing energy/water/raw materials), positive image building (public trust, enhanced social responsibility reputation), risk avoidance (preventing environmental fines/sanctions), and fostering greener products/processes (Lerman et al., 2022)

Core Green Operations principles encompass:

1. Reduce, Reuse, Recycle - minimizing waste through material reduction/reuse/recycling.
2. Energy Efficiency - employing energy-saving technologies.
3. Water Conservation - efficient water use and responsible wastewater management.
4. Sustainable Procurement - selecting environmentally friendly suppliers.
5. Pollution Prevention - avoiding air/water/soil contamination.
6. Green Product Design - creating recyclable, energy-efficient, environmentally safe products (Subkiman, 2017).

1.2.4 Service Quality

Eco-friendly service quality is essential for retaining existing customers and attracting new ones (Rahman et al., 2023). Service quality combines characteristics meeting customer expectations across marketing, engineering, production, and maintenance (Prihanto & Usmar, 2020), determined by actual customer experiences against specific attributes/requirements (Rajab & Nora, 2021).

Service quality involves intangible processes in customer-employee interactions, physical resources/goods, or service systems solving customer issues (Mjaku, 2020). Products/services must adapt to evolving preferences via quality improvements, personnel skills, production processes, and environments. Common quality elements include satisfying/exceeding expectations, encompassing products/services/processes/environments, and dynamism current quality may lag future standards. Critical components: expected excellence levels and control to meet customer needs.

1.2.5 Sustainability Performance

Sustainability performance reflects companies' internal resource management impacts using performance approaches tied to societal, economic, and environmental relations in sustainable development eras (Tjahjadi et al., 2021). Sustainability performance reflects the impact of internal resource management on organizational outcomes through integrated economic, environmental, and social measures. This view is consistent with (Sulistyowati & Purnomo, 2020), who emphasize that operational and supply chain strategies significantly influence

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company performance and can strengthen competitive advantage. Organizations task managers with sustainability encompassing social/economic/environmental issues for sustainability performance (Westerman et al., 2022). It balances financial/environmental/social pillars for competitiveness/resource management, extending beyond economics to environmental performance, human rights, ethics, and community participation (Wang & Yang, 2021).

Indonesian banking data highlights policy adoption (POJK No. 51/POJK.03/2017 mandating sustainability reports since 2017; varying quality, with large banks comprehensive), green taxonomy (10-15% green financing initially), low green portfolio share (~10% credits), high-risk sector reliance (mining/palm oil), partial international alignment (Equator Principles/SDGs by major banks), capacity gaps (40% banks lack ESG risk evaluators per WWF 2021), government incentives (subsidies/LPDB guarantees underutilized), and rising market pressure (70% consumers pay premiums for sustainable institutions; ESG investment trends) (Yovita et al., n.d.)

1.3 Hypothesis Development

Conceptual Framework

Based on Stakeholder Theory and the Triple Bottom Line framework, green operations are expected to improve service quality and sustainability performance by addressing environmental, social, and economic responsibilities of banking institutions. This study's conceptual framework positions green operations as the exogenous variable that influences service quality and sustainability performance both directly and indirectly through service quality mediation. This relationship is supported by stakeholder theory, which emphasizes corporate accountability for sustainable operations toward stakeholders (Kashi et al., 2024). The model is tested using Structural Equation Modeling-Partial Least Square (SEM-PLS) on employees of PT Bank Shinhan Indonesia.

Figure1. Framework
Research Hypotheses

H1: Green Operations positively influence Service Quality
H2: Service Quality positively influences Sustainability Performance
H3: Green Operations positively influence Sustainability Performance
H4: Green Operations positively influence Sustainability Performance through Service Quality

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2. Method

This research uses a quantitative approach with an associative research type, as described by (Sugiyono, 2019) who states that quantitative research is used to examine populations or samples using statistical analysis, aiming to analyze the causal relationship between Green Operations, Service Quality, and Sustainability Performance at PT Bank Shinhan Indonesia. The data used are primary data collected through the distribution of structured questionnaires to respondents who meet the research criteria.

In this study, Sustainability Performance is set as the dependent variable, Green Operations as the independent variable, and Service Quality as the mediating variable. Data collection was conducted in 2025. Data analysis uses the Structural Equation Model–Partial Least Square (SEM–PLS) method because it is suitable for complex research models, limited sample sizes, and does not require normal data distribution.

The unit of analysis in this study is employees of PT Bank Shinhan Indonesia who have an understanding of the company's operations and services. The research population includes all employees, while sample selection is done using purposive sampling, which is the selection of respondents based on certain considerations, including: (1) permanent employee status, (2) having a minimum of one year of service, and (3) understanding operational processes and the quality of company services. Based on these criteria, the number of collected samples eligible for analysis was 102 respondents.

The obtained data were then analyzed through a series of SEM–PLS stages, including testing the measurement model (outer model), testing the structural model (inner model), and hypothesis testing through bootstrapping procedures. The analysis results were used to assess both the direct and indirect effects between variables as well as to examine the mediating role of Service Quality in the research model.

3. Results

The research involved 102 employees of PT Bank Shinhan Indonesia with a balanced gender composition between men (51%) and women (49%). The majority of respondents were in the age groups 30–35 years (33.3%) and >40 years (32.4%), indicating a dominance of productive and experienced employees. Based on work placement, more than half of the respondents came from the Kantor Cabang (52.9%), followed by Head Office and Kantor Cabang Pembantu, each with 18.6%. In terms of position, respondents were dominated by Officers (52.9%), followed by Supervisors (16.7%). Most respondents had a work tenure in the range of 5–10 years (56.9%), indicating that the majority have sufficient work experience to provide representative answers to the research variables.

3.1 Data Analysis Results

Data analysis was conducted using SEM-PLS through SmartPLS 4 to test the causal relationships among latent variables simultaneously. This method was chosen because it is

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suitable for data with a non-normal distribution and a relatively small sample size. The research model consists of a measurement model and a structural model, with the path diagram illustrating the relationships between constructs shown in the following figure.

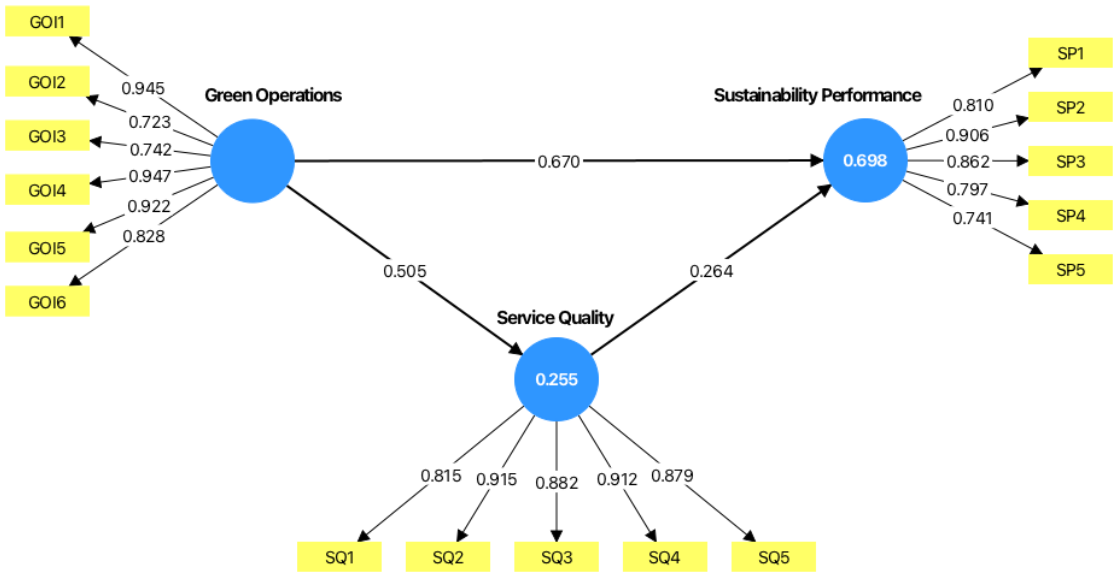

Figure 2. shows the output of SmartPLS 4.

The analysis was conducted in two stages: testing the outer model to ensure the validity and reliability of indicators, and testing the inner model to assess the relationships between latent variables and to test the research hypotheses.

3.1.1 Measurement Model Test Results (Outer Model)

The measurement model test was conducted to ensure that the indicators used can accurately represent the constructs.

1. Validity Test Results

The validity test was conducted to ensure that each indicator is able to measure the intended construct. Convergent validity was evaluated through the loading factor and AVE values, with criteria of loading factor ≥ 0.70 and AVE ≥ 0.50.

Table 4.1 Convergent Validity – Loading Factor

Variable	Indicator	Loading Factor Value	Description
Green Operations	GOI1	0.945	Valid
	GOI2	0.723	Valid
	GOI3	0.742	Valid
	GOI4	0.947	Valid
	GOI5	0.922	Valid
	GOI6	0.828	Valid
Service Quality	SQ1	0.815	Valid
	SQ2	0.915	Valid
	SQ3	0.882	Valid
	SQ4	0.912	Valid
	SQ5	0.879	Valid
Sustainability Performance	SP1	0.810	Valid
	SP2	0.906	Valid
	SP3	0.862	Valid
	SP4	0.797	Valid
	SP5	0.741	Valid

Source: Processed Data from SmartPLS 4, 2025

Table 4.1 shows that all indicators have a loading factor > 0.70, thus meeting convergent validity.

Table 4.2 Convergent Validity Test Results – AVE

Variable	AVE Value	Description
Green Operations	0.733	Valid
Service Quality	0.777	Valid
Sustainability Performance	0.680	Valid

Source: Processed Data from SmartPLS 4, 2025

The results in Table 4.2 show that all constructs have AVE > 0.50, therefore all are declared to meet convergent validity.

2. Discriminant Validity (DV)

Discriminant validity ensures that each construct is unique and does not overlap with other constructs. In SEM-PLS, DV is tested using three approaches: Cross Loading (CL), Fornell–Larcker Criterion (FLC), and Latent Variable Correlation Matrix (LVCM). DV is satisfied when

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each indicator has the highest loading on its original construct compared to other constructs.

Table 4.3 Discriminant Validity Test Results – Cross Loading

Indicator	Green Operations	Service Quality	Sustainability Performance	Description
GOI1	0.945	0.456	0.738	Valid
GOI2	0.723	0.297	0.607	Valid
GOI3	0.742	0.557	0.691	Valid
GOI4	0.947	0.443	0.727	Valid
GOI5	0.922	0.401	0.717	Valid
GOI6	0.828	0.397	0.621	Valid
SQ1	0.395	0.815	0.463	Valid
SQ2	0.543	0.915	0.615	Valid
SQ3	0.471	0.882	0.528	Valid
SQ4	0.426	0.912	0.526	Valid
SQ5	0.357	0.879	0.502	Valid
SP1	0.679	0.447	0.810	Valid
SP2	0.759	0.512	0.906	Valid
SP3	0.723	0.437	0.862	Valid
SP4	0.554	0.689	0.797	Valid
SP5	0.584	0.404	0.741	Valid

Source: Processed Data from SmartPLS 4, 2025

The cross loading test results in Table 4.3 show that each indicator has the highest loading on its original construct, thus fulfilling discriminant validity. The Fornell–Larcker test also confirms this, where the square root of the AVE for each construct is higher than its correlations with other constructs.

Table 4.4 Discriminant Validity Test Results – Fornell-Larcker

Indicator	Green Operations	Service Quality	Sustainability Performance	Description
GOI1	0.856			Valid
GOI2	0.505	0.881		Valid
GOI3	0.804	0.603	0.825	Valid

Source: Processed Data from SmartPLS 4, 2025

Table 4.4 shows that the square root of the AVE for each construct is higher than its correlations with other constructs, thus meeting the discriminant validity criteria according to Fornell–Larcker. Additionally, the HTMT method is used to ensure differences between constructs, with

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a threshold value of < 0.90 indicating fulfilled discriminant validity.

Table 4.5 Discriminant Validity Test Results – HTMT

Variable	Green Operations	Service Quality	Sustainability Performance	Description
Green Operations	-	0.505	0.804	Valid
Service Quality	0.505	-	0.603	Valid
Sustainability Performance	0.804	0.603	-	Valid

Source: Processed Data from SmartPLS 4, 2025

Table 4.5 shows that all HTMT values are < 0.90, indicating that discriminant validity is fulfilled. Thus, each construct Green Operations, Service Quality, and Sustainability Performance has a clear and distinct concept without overlapping.

3.1.2 Reliability Test Results

After validity testing, reliability was assessed to evaluate the internal consistency of the constructs. A construct is considered reliable if it has composite reliability and Cronbach's alpha greater than 0.70. The test results showed that all constructs met these criteria, thus declared reliable.

Table 4.6 Reliability Test Results

Variable	Cronbach's Alpha	Composite Reliability	Description
Green Operations	0.924	0.942	Reliable
Service Quality	0.928	0.945	Reliable
Sustainability Performance	0.881	0.914	Reliable

Source: Processed Data from SmartPLS 4, 2025

Based on the validity test results in Table 4.6 above, all constructs have composite reliability values above 0.70 and Cronbach's alpha above 0.70. Therefore, it can be concluded that the constructs have good reliability.

3.1.3 Structural Model Test Results (Inner Model)

After the outer model is declared valid and reliable, the inner model test is conducted to assess the strength and significance of relationships between constructs. The evaluation includes Goodness of Fit (GoF), effect size (f^2), and multicollinearity test (VIF) to ensure the structural model's suitability.

1. Goodness of Fit Test Results

Goodness of Fit is evaluated using two main indicators: R-Square (R^2) and Q-Square (Q^2), in line

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with SEM-PLS characteristics that emphasize predictive ability. The R^2 value is used to assess the ability of exogenous variables to explain the variance of endogenous variables, categorized as strong (≥0.67), moderate (≥0.33), and weak (≥0.19). The R^2 results for this study are presented in the following table.

Table 4.7 R-Square (R^2) Test Results

Variable	Adjusted R-Square	Description
Service Quality	0.247	Weak
Sustainability Performance	0.692	Strong

Source: Processed Data from SmartPLS 4, 2025

Table 4.7 shows that Service Quality has an R^2 value of 0.247, categorized as weak, meaning Green Operations explains only 24.7% of its variance. In contrast, Sustainability Performance has an R^2 value of 0.692, categorized as strong, indicating that 69.2% of its variance can be explained by constructs in the model. This shows that the model is stronger at explaining Sustainability Performance than Service Quality.

The Q-Square (Q^2) value is used to assess the model's predictive ability, interpreted as strong (>0.35), moderate (0.15–0.35), and weak (0–0.15). The Q^2 results of the study are presented in the following table.

Table 4.8 Q-Square (Q^2) Test Results

Variable	Q2 Predict	Description
Service Quality	0.218	Moderate Predictive Power
Sustainability Performance	0.639	Strong Predictive Power

Source: Processed Data from SmartPLS 4, 2025

Table 4.8 shows that Service Quality has a Q^2 value of 0.218 (moderate prediction), while Sustainability Performance has a Q^2 value of 0.639 (strong prediction). Thus, the model has good predictive relevance, especially in explaining Sustainability Performance, and is suitable for prediction purposes.

3. Effect Size (f^2) Test Results

The effect size (f^2) test is used to assess the magnitude of each exogenous variable's contribution in explaining the endogenous variable. According to Cohen's criteria (1988), f^2 is categorized as large (≥0.35), medium (0.15–<0.35), small (0.02–<0.15), and very small (<0.02). The f^2 calculation results for this study are presented in the following table.

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Table 4.9 Effect Size (f^2) Test Results

Variable	Service Quality	Sustainability Performance	Description
Green Operations	0.341	1.11	Large Effect
Service Quality		0.173	Moderate Effect

Source: Processed Data from SmartPLS 4, 2025

Based on Table 4.9, green operations has an f^2 of 0.341 on service quality and 1.11 on sustainability performance, both categorized as large effects. Meanwhile, service quality has an f^2 of 0.173 on sustainability performance, which is a moderate effect.

Thus, green operations is the most dominant construct influencing both endogenous variables, while service quality still contributes significantly to sustainability performance. These findings confirm that improving green operations practices directly impacts service quality and the company's sustainability performance.

4. Multicollinearity Test Results

The multicollinearity test is conducted to ensure there is no excessive correlation among independent variables. In SEM-PLS, the Variance Inflation Factor (VIF) value is used as an indicator. The model is considered free from multicollinearity if VIF < 10 or the correlation between exogenous variables is < 0.8. This criterion is used to assess the model's suitability before advanced analysis.

Table 4.10 Multicollinearity Test Results for Inner Model (VIF)

Variable	Service Quality	Sustainability Performance	Description
Green Operations	1	1.341	No Multicollinearity Detected
Service Quality		1.341	No Multicollinearity Detected

Source: Processed Data from SmartPLS 4, 2025

Table 4.10 shows that all tolerance values are > 0.01, equivalent to VIF < 10, for the relationships involving Green Operations and other variables, indicating no multicollinearity issues.

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Table 4.11 Multicollinearity Test Results for Outer Model (VIF)

Indicator	VIF Value	Description
GOI1	1.671	No Multicollinearity Detected
GOI2	1.891	No Multicollinearity Detected
GOI3	2.183	No Multicollinearity Detected
GOI4	5.044	No Multicollinearity Detected
GOI5	5.289	No Multicollinearity Detected
GOI6	2.819	No Multicollinearity Detected
SQ1	2.372	No Multicollinearity Detected
SQ2	3.713	No Multicollinearity Detected
SQ3	3.111	No Multicollinearity Detected
SQ4	5.007	No Multicollinearity Detected
SQ5	3.792	No Multicollinearity Detected
SP1	2.691	No Multicollinearity Detected
SP2	3.998	No Multicollinearity Detected
SP3	2.574	No Multicollinearity Detected
SP4	2.150	No Multicollinearity Detected
SP5	1.844	No Multicollinearity Detected

Source: Processed Data from SmartPLS 4, 2025

Table 4.11 shows that all VIF values range from 1.671 to 5.289, which are still below the threshold of 10. Thus, the outer model does not experience multicollinearity. Overall, both the inner and outer models are free from multicollinearity issues, so the estimation of relationships between constructs can be considered stable and accurate.

3.1.4 Hypothesis Test Results

Direct effect occurs when an independent variable directly influences the dependent variable without passing through another construct. The direct effect hypothesis test results in this study are as follows:

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Table 4.12 Direct Effect Hypothesis Test Results

Hypothesis	Original Sample	T-Statistics	P-values	Description
Green Operations → Service Quality	0.505	4.992	0.000	H1 Significant, Accepted
Service Quality → Sustainability Performance	0.264	2.74	0.003	H2 Significant, Accepted
Green Operations → Sustainability Performance	0.67	8.543	0.000	H3 Significant, Accepted

Source: Processed Data from SmartPLS 4, 2025

Based on the direct effect hypothesis test results (Table 4.12), all hypotheses are accepted as they meet the criteria $t > 1.96$ and $p < 0.05$. Green operations has a significant effect on both service quality and sustainability performance, while service quality also significantly affects sustainability performance. Next, indirect effects are tested to examine the mediating role within the model.

Table 4.13 Indirect Effect Hypothesis Test Results

Hypothesis	Original Sample	T-Statistics	P-values	Description
Green Operations → Service Quality → Sustainability Performance	0.133	2.165	0.015	H4 Significant, Accepted

Source: Processed Data from SmartPLS 4, 2025

Based on the indirect effect test results (Table 4.13), all hypotheses are accepted because $t > 1.96$ and $p < 0.05$. This indicates that green operations not only has a direct effect but also an indirect effect on sustainability performance through service quality. Thus, service quality acts as a partial mediator in this relationship. Next, the total effect is used to observe the overall direct and indirect influence among constructs in the model.

Table 4.14 Total Effect Hypothesis Test Results

Relationship	Direct Effect	Indirect Effect	Total Effect
Green Operations → Sustainability Performance	0.670	0.133	0.803

Source: Processed Data from SmartPLS 4, 2025

Based on the total effect hypothesis test results in Table 4.14, with a total effect of 0.803, green operations has a very strong and significant influence on sustainability performance, both directly and indirectly through service quality. This means that in this research context, the success of the company's sustainability performance is heavily influenced by the implementation of environmentally friendly operations, reinforced by the quality of services delivered.

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1. Executive Summary SEM-PLS

The data analysis results explain the outcomes of the structural model test and the effects between variables using the Partial Least Squares - Structural Equation Modeling (SEM-PLS) method, based on the loading factor of each indicator for every variable.

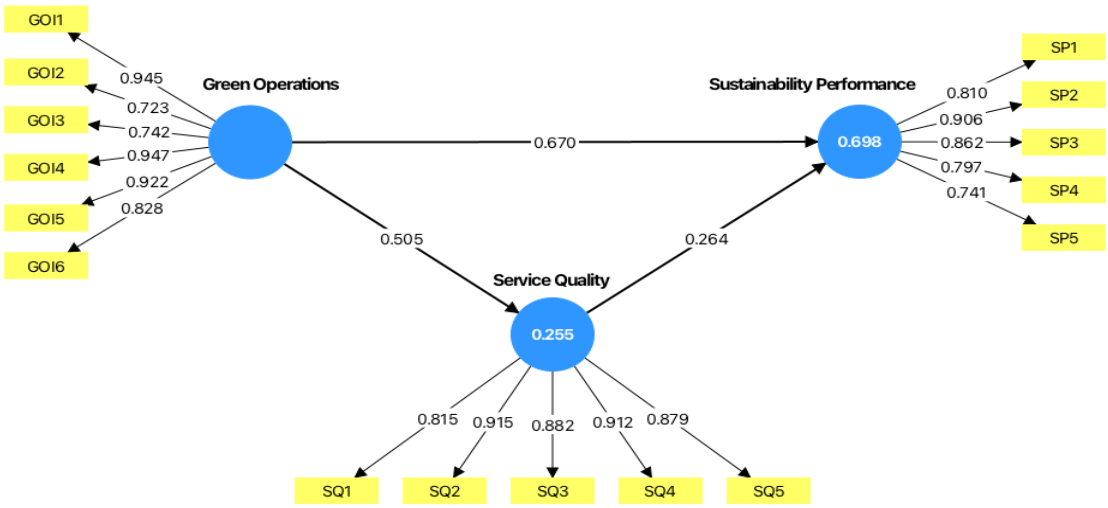

Figure 3 Bootstrapping: Executive Summary SEM-PLS
Source: Processed Data from SmartPLS 4, 2025

Loading factor measures the contribution of each indicator to the latent construct. In SEM-PLS, an indicator is considered valid or qualifies to contribute to the construct if it has a loading factor > 0.700 and a p-value < 0.05, meaning statistically significant.

Table 4.15 Loading Factor for Green Operations Variable

Indicator	**Loading Factor**	**P-Value**
GOI1 → The company's paperless banking program reduces carbon footprint from internal operations and saves costs	0.945	0.000
GOI2 → The company offers low-interest rates to consumers and businesses for installing solar energy systems and energy-efficient equipment	0.723	0.000
GOI3 → The company provides training to increase employees' environmental awareness	0.742	0.000
GOI4 → The company builds and implements green buildings	0.947	0.000
GOI5 → The company is environmentally friendly regarding emissions and pollution	0.922	0.000
GOI6 → The company manages waste processing and recycling	0.828	0.000

Source: Processed Data from SmartPLS 4, 2025

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Based on Table 4.15, all indicators in the green operations variable show a p-value of 0.000, meaning significant at a 95% confidence level. All indicators of the green operations construct have loading factors above 0.70, so they are valid and significant. GOI4 (green buildings) is the highest indicator, indicating that environmentally friendly infrastructure stands out in the perception of green operations at PT Bank Shinhan Indonesia. In contrast, GOI2 (low-interest incentives), while valid, contributes less, likely because it is more externally focused (aimed at customers) compared to other indicators, which are more operationally internal.

Table 4.16 Loading Factor for Service Quality Variable

Indicator	Loading Factor	P-Value
SQ1 → Company employees can resolve every customer problem	0.815	0.000
SQ2 → Company employees provide services with high accuracy	0.915	0.000
SQ3 → Company employees are very helpful and trustworthy	0.882	0.000
SQ4 → Company employees perform work effectively	0.912	0.000
SQ5 → Company employees show a strong willingness to serve customers	0.879	0.000

Source: Processed Data from SmartPLS 4, 2025

Based on Table 4.16, all indicators meet the validity criteria and are statistically significant (p-value = 0.000). This means all indicators well represent service quality. SQ2 (service accuracy) has the highest loading factor, showing that in PT Bank Shinhan Indonesia's context, employees' technical competence (accuracy and effectiveness) is most prominent in customers' perception of service quality. Meanwhile, SQ1 (ability to resolve customer problems) has the lowest contribution, possibly indicating suboptimal problem handling, inconsistent responses, and some customers might feel their issues are unresolved.

Table 4.17 Loading Factor for Sustainability Performance Variable

Indicator	Loading Factor	P-Value
SP1 → The company's financing and lending activities cover social and environmental concerns	0.810	0.000
SP2 → The company commits to environmentally responsible behavior	0.906	0.000
SP3 → The company supports social development in the community	0.862	0.000
SP4 → The company maintains high socio-ethical standards through anti-corruption policies, proper and humane business ethics	0.797	0.000
SP5 → The company's code of ethics is globally sustainable and engages stakeholders in disclosing non-financial performance	0.741	0.000

Source: Processed Data from SmartPLS 4, 2025

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Based on Table 4.17, all indicators have p-values < 0.05, meaning statistically significant. Loading factors > 0.70 indicate these indicators are valid in measuring the sustainability performance construct. SP2 (Environmental dimension) has the highest loading factor and is the main focus in the perception of sustainability performance, representing the company's strength. While SP5 (Ethical transparency) is valid, it has the lowest loading factor, showing a weaker contribution to the construct. This may be caused by weak implementation of a globally sustainable corporate code of ethics and limited stakeholder engagement in disclosing non-financial performance.

Discussion

The Effect of Green Operations on Service Quality

SEM-PLS analysis results show that green operations have a positive and significant effect on service quality ($\beta = 0.505$; $t = 4.992$; $p = 0.000$), so H1 is accepted. This finding indicates that the better the implementation of environmentally friendly operational practices, the higher the perceived service quality.

In the banking context, green operations include service digitalization, reducing paper usage, energy efficiency, and adopting environmentally friendly technologies. These practices not only reduce environmental footprints but also improve operational efficiency and customer perceptions regarding speed, convenience, and the company's sustainability commitment.

This result is consistent with previous studies (Md. S. Rahman et al., 2025); (Kumar et al., 2024); (Ratnasari et al., 2021)., which state that green practices support improving perceived service quality. Thus, implementing green operations at PT Bank Shinhan Indonesia proves to be an effective strategy to strengthen service quality and the company's sustainability image.

The Effect of Service Quality on Sustainability Performance

SEM-PLS results show that service quality has a positive and significant effect on sustainability performance ($\beta = 0.264$; $t = 2.740$; $p = 0.003$), so H2 is accepted. This means that higher service quality leads to better corporate sustainability performance.

In banking, service quality includes reliability, responsiveness, assurance, empathy, and tangibles. Improving these aspects not only increases customer satisfaction and loyalty but also strengthens the company's image as an ethical and long-term oriented institution an essential element in sustainability performance.

These findings align with previous studies (Elsaddai & Wiryakusuma, 2024); (Fitriensi et al., 2019); (Khan et al., 2024), which emphasize that service quality plays a crucial role in supporting sustainability dimensions, including social aspects and governance (ESG). Practically, enhancing service quality at PT Bank Shinhan Indonesia has proven to be an effective strategy in driving successful sustainability performance.

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The Effect of Green Operations on Sustainability Performance

The test results show that green operations have a positive and significant effect on sustainability performance ($\beta = 0.670$; $t = 8.543$; $p = 0.000$), so H3 is accepted. This means that the stronger the implementation of environmentally friendly operations, the higher the company's sustainability performance.

In banking, green operations include energy efficiency, service digitalization to reduce paper usage, waste management, and the use of low-emission technology. These practices have been proven to increase operational efficiency while strengthening environmental, social, and governance (ESG) aspects.

This finding aligns with previous studies (Karyani & Obrien, 2020); (Brar, n.d.), which highlight green operations as a key driver for enhancing sustainability performance. Practically, these results indicate that PT Bank Shinhan Indonesia's efforts to expand and maintain green operational practices are an important strategy to improve sustainability performance and the company's competitiveness.

The Effect of Green Operations on Sustainability Performance through Service Quality

The analysis results show that green operations have a significant indirect effect on sustainability performance through service quality (indirect effect = 0.133; $t = 2.165$; $p = 0.015$), so H4 is accepted. This means that environmentally friendly operational practices not only directly impact sustainability but also enhance sustainability performance by improving service quality.

The implementation of green operations such as service digitalization, energy efficiency, and waste reduction contributes to faster, more efficient, and environmentally friendly services. This improved service quality strengthens the perception of corporate sustainability. Thus, service quality acts as a partial mediator, reinforcing the effect of green operations on sustainability performance.

This finding is consistent with previous studies (Ismail, 2023); (Rehan et al., 2025), which emphasize the mediating role of service quality in the relationship between green practices and sustainability. Practically, these results highlight the importance of integrating environmental strategies with service quality improvement to achieve more optimal sustainability performance at PT Bank Shinhan Indonesia.

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References

Akadiati, V. A. P., Purwati, A. S. M., & Sinaga, I. (2023). Penerapan Standar Pelaporan Keberlanjutan GRI dan Profitabilitas terhadap Nilai Perusahaan. *Ekonomis: Journal of Economics and Business*, *7*(2), 1008. https://doi.org/10.33087/ekonomis.v7i2.1232

BPS. (2021). United Nations. https://doi.org/10.18356/9789210010788

Brar, (n.d). *ENVISION-International Journal of Commerce and Management Green Banking Adoption: A Comparative Study of Indian Public and Private Sector Banks*. http://afca.apeejay.edu

Chen, J., Siddik, A., Zheng, G.-W., Masukujjaman, M., & Bekhzod, S. (2022). The Effect of Green Banking Practices on Banks' Environmental Performance and Green Financing: An Empirical Study. *Energies*, *15*(4), 1292. https://doi.org/10.3390/en15041292

Elsaddai, T., & Wiryakusuma, I. G. B. Y. (2024). THE INFLUENCE OF PRICE PERCEPTIONS AND SERVICE QUALITY ON PURCHASING DECISIONS FOR ITEMKU CONSUMERS IN SURABAYA. *PERFORMA*, *9*(1), 79–90. https://doi.org/10.37715/jp.v9i1.3802

Fitriensi, Y. N., Agus, H., Suryanto, D., & Adriansyah, A. (2019). *Pengaruh Banking Service Quality (BSQ) Terhadap Kepuasan Nasabah Dan Dampaknya Terhadap Loyalitas Nasabah Pada Bank CIMB Niaga Syariah Padang* (Vol. 6, Issue 2).

Ismail, I. J. (2023). I have to apply this strategy! Understanding the mediating effect of digitalization on strategic orientations and sustainable competitive advantage among small enterprises in Tanzania. *Management Matters*, *20*(1), 53–73. https://doi.org/10.1108/MANM-01-2022-0019

Kashi, A., Laallam, A., Mansour Nomran, N., Azmi Abumughli, A., & Al-Binali, T. (2024). Do institutional environment and corporate governance structures determine Islamic Banks' sustainability performance? Evidence across key jurisdictions in Islamic finance industry. *Borsa Istanbul Review*, *24*(6), 1088–1100. https://doi.org/10.1016/j.bir.2024.06.005

Khan, M. R., Pervin, M. T., Arif, M. Z. U., & Hossain, S. M. K. (2024). The impact of technology service quality on Bangladeshi banking consumers' satisfaction during the pandemic situation: Green development and innovation perspective in banking service. *Innovation and Green Development*, *3*(2), 100120. https://doi.org/10.1016/j.igd.2023.100120

Kumar, J., Rani, G., Rani, M., & Rani, V. (2024). Do green banking practices improve the sustainability performance of banking institutions? The mediating role of green finance. *Social Responsibility Journal*, *20*(10), 1990–2007. https://doi.org/10.1108/SRJ-02-2024-0096

Lerman, L. V., Benitez, G. B., Müller, J. M., de Sousa, P. R., & Frank, A. G. (2022). Smart green supply chain management: a configurational approach to enhance green performance through digital transformation. *Supply Chain Management: An International Journal*, *27*(7), 147–176. https://doi.org/10.1108/SCM-02-2022-0059

Mir, A. A., & Bhat, A. A. (2022). Green banking and sustainability – a review. *Arab Gulf*

Journal of Scientific Research, *40*(3), 247–263. https://doi.org/10.1108/AGJSR-04-2022-0017

Mjaku, G. (2020). The impact of service quality and customer satisfaction on banking services - an overview! *International Journal of Scientific and Research Publications (IJSRP)*, *10*(9), 811–814. https://doi.org/10.29322/IJSRP.10.09.2020.p10597

Nusraningrum, D., Mekar, T. M., Endri, E., & Ahmad, F. S. (2023). Does implementing green operation management affect the Sustainability of port operations in Labuan Bajo? *Uncertain Supply Chain Management*, *11*(4), 1417–1426. https://doi.org/10.5267/j.uscm.2023.8.005

Pebrian, A., Eka Pambudi, J., Hidayat, I., Febrianto, H. G., Maulidia, Z., & Septian, A. (2024). The Effect of Implementation of Green Banking, Corporate Social Responsibility on The Value of Banking Companies Registered With The OJK Period 2017-2021. *Proceedings of the 1st UHAMKA International Conference on Economics and Business, UHICEB 2023, 18-19 December 2023, Jakarta, Indonesia*. https://doi.org/10.4108/eai.18-12-2023.2350398

Prihanto, H., & Usmar, U. (2020). Faktor Yang Menunjang Kualitas Pengadaan Barang Dan Jasa Pemerintah. *Jurnal Akuntansi Dan Bisnis Indonesia (JABISI)*, *1*(2), 71–82. https://doi.org/10.55122/jabisi.v1i2.183

Rahman, M. H., Rahman, J., Tanchangya, T., & Esquivias, M. A. (2023). Green banking initiatives and sustainability: A comparative analysis between Bangladesh and India. *Research in Globalization*, *7*, 100184. https://doi.org/10.1016/j.resglo.2023.100184

Rahman, M. S., Moral, I. H., Akther, S., Hossain, G. M. S., & Islam, W. (2025). What drives green banking operations in Bangladesh? Findings from PLS-SEM and BSEM. *Asian Journal of Economics and Banking*, *9*(1), 83–104. https://doi.org/10.1108/AJEB-09-2023-0088

Rajab, A., & Nora, L. (2021). PERAN KEPUASAN KONSUMEN DALAM MENENTUKAN PENGARUH KUALITAS PRODUK TERHADAP LOYALITAS KONSUMEN. *Jurnal Muhammadiyah Manajemen Bisnis*, *2*(2), 73–84. https://doi.org/10.24853/jmmb.2.2.73-84

Ratnasari, T., Surwanti, A., & Pribadi, F. (2021). *Implementation of Green Banking and Financial Performance on Commercial Banks in Indonesia* (pp. 323–336). https://doi.org/10.1108/S1571-038620210000028018

Rehan, M. H., Yeo, S. F., Khan, I. U., & Tan, C. L. (2025). Redefying the strength between CSR and sustainable social performance through mediational role of green intellectual capital. *Cleaner and Responsible Consumption*, *16*, 100238. https://doi.org/10.1016/j.clrc.2024.100238

Subkiman, A. (2017). Kajian Teori Integral dalam Efektivitas Transformasi Kesadaran Lingkungan pada Bangunan Berkelanjutan. *Jurnal Rekayasa Hijau*, *1*(2). https://doi.org/10.26760/jrh.v1i2.1632

Sugiyono. (2019). *Metodelogi Penelitian Kuantitatif dan Kualitatif Dan R&D*. Alfabeta.

Sulistyowati, N., & Purnomo, W. D. (2020). *Effects of Supply Chain Strategy on Company Performance : The Moderating Role of Competitive Advantage*. *9*(4), 141–149.

Thomas, A., Ma, S., Ur Rehman, A., & Usmani, Y. S. (2022). Green Operation Strategies in Healthcare for Enhanced Quality of Life. *Healthcare*, *11*(1), 37.

Vol. 10, No.01; 2026

ISSN: 2456-7760

https://doi.org/10.3390/healthcare11010037

Tjahjadi, B., Soewarno, N., & Mustikaningtiyas, F. (2021). Good corporate governance and corporate sustainability performance in Indonesia: A triple bottom line approach. *Heliyon*, *7*(3), e06453. https://doi.org/10.1016/j.heliyon.2021.e06453

Wang, Y., & Yang, Y. (2021). Analyzing the green innovation practices based on sustainability performance indicators: a Chinese manufacturing industry case. *Environmental Science and Pollution Research*, *28*(1), 1181–1203. https://doi.org/10.1007/s11356-020-10531-7

Westerman, J. W., Acikgoz, Y., Nafees, L., & Westerman, J. (2022). When sustainability managers' greenwash: SDG fit and effects on job performance and attitudes. *Business and Society Review*, *127*(2), 371–393. https://doi.org/10.1111/basr.12273