



CARBON PERFORMANCE AND FINANCIAL RESILIENCE: EVIDENCE FROM INDONESIAN BANKING SECTOR

Maria Putri Aleta Lidiani Wuwur¹, Dwitya Aribawa²

^{1,2} Magister Management Department, Faculty of Business and Economics,
Atma Jaya Yogyakarta University

¹maria.wuwur@gmail.com, ²dwitya.aribawa@uajy.ac.id

ABSTRACT

This study investigates the impact of carbon performance on the financial performance of banking companies listed on the Indonesia Stock Exchange (IDX) during the period 2020–2024. Unlike prior studies that predominantly focus on manufacturing or extractive sectors, this research highlights the banking industry, which plays a pivotal role in sustainable financing and carbon transition strategies. Carbon performance is measured by the efficiency of carbon emission management, while financial performance is evaluated using a combination of regulatory-based indicators (Risk Profile/NPL, Good Corporate Governance/GCG, Earnings/ROA, and Capital/CAR) and a market-based measure (Market-to-Book Ratio/MBR). The findings are expected to provide empirical evidence on whether stronger carbon performance translates into enhanced financial stability, profitability, and market valuation. By integrating regulatory and market perspectives, this study contributes to the growing discourse on sustainable finance, offering practical implications for banking institutions, investors, and policymakers in navigating the transition toward a low-carbon economy in emerging markets.

Keywords: carbon performance, financial performance, banking sector, sustainable finance, RGEC, market valuation, Indonesia

1. Introduction

Indonesia is one of the largest carbon emitters in the world, ranked sixth globally in 2024 after China, the United States, India, Russia, and Japan. Despite a slight decline in emissions in 2023, heavy reliance on coal as the primary energy source continues to pose risks for future emissions growth. The Indonesian government has shown strong commitment to climate action through the Paris Agreement, carbon tax implementation, and net-zero targets.

Banks, while not directly emitting carbon at the same scale as manufacturing industries, play a pivotal role in supporting sustainable financing. They act as intermediaries that channel funds into green investments. Global studies suggest mixed evidence on the relationship between carbon performance and financial outcomes, highlighting the need for deeper analysis, particularly in emerging markets.

This study addresses research gaps by focusing on Indonesian banks, integrating both accounting-based (RGEC indicators: NPL, GCG, ROA, CAR) and market-based (MBR) measures. It contributes to the literature by situating carbon performance in the context of regulatory pressure and market dynamics within Indonesia's low-carbon transition.

The purpose of this study is to analyze the effect of carbon performance on bank financial performance, both accounting-based and market-based.

2. Literature Review

This study is grounded in several theoretical perspectives. Legitimacy Theory suggests that firms adopt environmentally responsible practices to align with societal norms and secure social acceptance. Stakeholder Theory highlights the importance of addressing diverse stakeholder expectations, where carbon disclosure strengthens trust and long-term relationships. Signaling Theory views carbon performance disclosure as a positive signal of sustainability commitment that attracts investors and reduces capital costs. Additionally, Distraction Theory emphasizes that external

pressures such as regulations and stakeholder demands may act as efficiency drivers or burdens, depending on a firm’s readiness.

2.1. Financial and Carbon Performance

Financial performance in the banking sector is commonly assessed through the Risk-Based Bank Rating (RGEC) framework mandated by the Financial Services Authority (OJK), which includes four key indicators: Risk Profile (NPL), Good Corporate Governance (GCG), Earnings (ROA), and Capital (CAR). In addition, the Market-to-Book Ratio (MBR) is employed as a measure of market-based performance, capturing investors’ valuation of the firm relative to its book value.

Carbon performance reflects the extent to which companies measure, manage, and reduce greenhouse gas (GHG) emissions (Velte et al., 2020). Firms with strong carbon performance are expected to achieve greater operational efficiency, lower environmental and regulatory risks, and enhanced corporate reputation, thereby strengthening both financial and market performance.

This study is grounded in several theoretical perspectives. Legitimacy Theory emphasizes that firms adopt environmentally responsible practices to align with societal norms and secure social acceptance. Stakeholder Theory highlights the importance of addressing diverse stakeholder expectations, where carbon management becomes a mechanism to build trust and maintain long-term relationships. Signaling Theory explains how transparent disclosure of carbon performance serves as a positive signal to investors regarding a firm’s sustainability commitment. Complementing these views, the Resource-Based View (RBV) positions carbon performance as a strategic intangible resource that can generate competitive advantage, while the Triple Bottom Line (TBL) underscores the need to balance environmental, social, and financial dimensions in evaluating corporate success.

Prior empirical evidence presents inconsistent findings. Some studies report that carbon performance positively influences profitability and market valuation, while others reveal negative or insignificant effects. These inconsistencies may result from differences in industry characteristics, methodological approaches, and country-specific regulatory contexts. Given these gaps, this study aims to provide further empirical evidence by examining the relationship between carbon performance and financial performance in the Indonesian banking sector, a context that is both underexplored and strategically important in advancing sustainable finance.

2.2. Hypotheses

- H1: Carbon performance positively affects NPL.
- H2: Carbon performance positively affects GCG.
- H3: Carbon performance positively affects ROA.
- H4: Carbon performance positively affects CAR.
- H5: Carbon performance positively affects MBR.

3. Research Methods

3.1. Data and Sample

This study uses secondary data from Indonesian banks listed on the IDX during 2020–2024. Independent variable: carbon performance. Dependent variables: NPL, GCG, ROA, CAR, and MBR.

3.2. Data Robustness Test

Tabel 3.2 Data Robustness Test

Test	Purpose	Expected Result
Normality Test	Ensures normal distribution of residuals	Data normally distributed
Multicollinearity Test	Detects high correlation among independent variables	Tolerance > 0.10; VIF < 10
Heteroskedasticity Test	Checks homoscedastic variance of residuals	No systematic pattern
Autocorrelation Test	Ensures residual independence	Durbin-Watson $\approx$ 2

3.3. Data Analysis

Regression analysis is used to test hypotheses. Descriptive statistics (mean, min, max, standard deviation) are emphasized to describe financial and carbon performance of banks during the study period.

4. Research Findings and Discussion

4.1. Descriptive Statistics

Descriptive statistics provide an overview of the distribution of research variables. Table 1 presents the results. The results show that CP has the highest variation compared to other variables, while NPL is relatively stable with a small deviation.

Variable	N	Min	Max	Mean	Std. Deviation
CP	139	-0.0294	73.3816	2.1883	9.8311
NPL	139	0.0000	0.2227	0.0289	0.0267
GCG	139	0.1000	0.7500	0.5837	0.1361
ROA	139	-10.8500	1.7000	-0.2027	1.3700
CAR	139	0.1389	82.5200	1.4784	7.6945

4.2. Classical Assumption Tests

Prior to hypothesis testing, classical assumption tests were conducted. Normality test results show that all variables are normally distributed (Asymp. Sig > 0.05). Multicollinearity is not detected since Tolerance > 0.10 and VIF < 10. Heteroskedasticity is absent as the significance level of all models is greater than 0.05. Autocorrelation does not occur since the Durbin-Watson values fall within the acceptable range. These results confirm that the regression models satisfy the BLUE criteria.

4.3. Hypothesis Testing Results

Effect of CP on NPL

Equation (1): $NPL = 0.010 + 0.003CP$

The significance value ($0.027 < 0.05$) indicates that CP has a positive and significant effect on NPL. The coefficient of determination ($R^2 = 0.035$) shows that CP explains 3.5% of the variation in NPL.

Effect of CP on GCG

Equation (1): $NPL = 0.010 + 0.003CP$

The significance value ($0.027 < 0.05$) indicates that CP has a positive and significant effect on NPL. The coefficient of determination ($R^2 = 0.035$) shows that CP explains 3.5% of the variation in NPL.

Effect of CP on GCG

Equation (2): $GCG = 0.205 + 0.016CP$

The result shows a significance value of 0.040 (< 0.05), meaning CP has a positive and significant effect on GCG. The coefficient of determination ($R^2 = 0.030$) indicates that CP explains 3.0% of the variation in GCG.

Effect of CP on ROA

Equation (3): $ROA = 0.016 + 0.008CP$

The coefficient (0.008) and significance value ($0.007 < 0.05$) confirm that CP has a positive and significant effect on ROA. The coefficient of determination ($R^2 = 0.052$) reveals that CP explains 5.2% of ROA.

Effect of CP on CAR

Equation (4): $CAR = 0.086 + 0.010CP$

The significance value of 0.046 (< 0.05) indicates that CP has a positive and significant effect on CAR. The coefficient of determination ($R^2 = 0.029$) suggests that CP explains 2.9% of CAR.

4.4. Discussion

The findings reveal that Carbon Performance (CP) has a significant and positive impact on all banking performance indicators: NPL, GCG, ROA, and CAR. Interestingly, while CP improves governance, profitability, and capital adequacy, it also increases credit risk (NPL). This result suggests a potential trade-off: higher carbon-related commitments may generate additional financial pressure that influences loan quality. From a theoretical perspective, these findings align with Legitimacy Theory and Stakeholder Theory, which posit that firms improving their environmental performance gain legitimacy and trust, leading to better governance and financial outcomes. However, the small explanatory power (R^2 values below 6%) indicates that other factors beyond CP play a more substantial role in explaining banking performance.

5. Conclusion

The findings confirm that carbon performance (CP) has a significant influence on various aspects of banking performance. First, CP is found to increase non-performing loans (NPL), indicating a trade-off between the implementation of sustainability practices and credit asset quality. Second, CP makes a positive contribution to good corporate governance (GCG), consistent with legitimacy and stakeholder theories, which emphasize that sound carbon management enhances transparency and accountability. Furthermore, CP also has a positive impact on profitability (ROA), showing that success in managing carbon emissions supports the optimization of assets to generate profits. In addition, CP strengthens the capital adequacy ratio (CAR), suggesting that better environmental performance is correlated with stronger bank capitalization. Overall, these findings affirm that carbon performance not only plays a role in reinforcing corporate governance but also contributes to the stability and financial performance of banks, while still posing potential risks to credit quality.

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