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Green Credit, Carbon Emission Disclosure, and Bank Profitability: The Mediating Role of Non-Performing Loans

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ABSTRACT

This study investigates the effects of green credit and carbon emission disclosure on bank profitability, measured by Return on Assets (ROA), while examining the mediating role of Non-Performing Loans (NPLs) in Indonesian conventional commercial banks listed on the Indonesia Stock Exchange during the 2021–2025 period. A quantitative causal research design was employed using secondary data collected from annual reports and sustainability reports. The sample consisted of 25 commercial banks (125 firm-year observations) selected through purposive sampling. Panel data regression analysis was conducted using EViews. The findings indicate that both green credit and carbon emission disclosure have positive and significant effects on profitability, whereas NPL has a significant negative effect on profitability. Green credit does not significantly affect NPL; however, the mediation analysis indicates that NPL mediates the relationship between green credit and profitability. These findings suggest that sustainable financing practices, supported by transparent environmental disclosure and effective credit risk management, contribute to improving bank financial performance. This study contributes to the sustainable finance literature by providing empirical evidence on the interaction between green credit, carbon emission disclosure, and credit risk in the Indonesian banking sector, while offering practical insights for bank management and financial regulators in strengthening sustainable banking policies.

Keywords: Green Credit, Carbon Emission Disclosure, Non-Performing Loans, Profitability, Return on Assets.
JEL Code: G21, G32, Q54, Q56, Q58

I. Introduction

Environmental sustainability has become a fundamental issue influencing the long-term resilience and competitiveness of the global financial industry. Consequently, the banking sector is expected not only to generate financial returns but also to integrate environmental responsibility into its core business strategies. In Indonesia, this transition has been reinforced through OJK Regulation No. 51/POJK.03/2017 on Sustainable Finance, which requires financial institutions to implement environmental, social, and governance (ESG) principles and publish sustainability reports. In addition, the Indonesian Taxonomy for Sustainable Finance (TKBI) provides a national framework for classifying environmentally sustainable economic activities. As a result, banks are increasingly evaluated not only by their financial performance but also by their commitment to implementing sustainable finance practices and transparent sustainability reporting. Despite the rapid expansion of sustainable finance initiatives, Indonesian banks continue to face significant challenges in maintaining credit quality while pursuing sustainable business practices. According to the OJK Banking Sustainability Maturity Report (2025), the sustainable finance portfolio of the Indonesian banking sector

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reached IDR 2,075 trillion, representing 26.12% of the total credit portfolio by the end of 2024. During the same period, the absolute value of Non-Performing Loans (NPL) increased from IDR 154.977 trillion in December 2023 to IDR 162.906 trillion in December 2024, although the gross NPL ratio slightly declined from 2.19% to 2.08% due to higher credit growth. These conditions indicate that the expansion of sustainable financing has not automatically eliminated credit risk. Consequently, an important empirical question arises regarding whether the implementation of green credit and carbon emission disclosure can improve bank profitability while maintaining sound credit quality, particularly in the Indonesian banking sector.

Green credit has become one of the principal instruments supporting the implementation of sustainable finance in the banking industry. Beyond regulatory compliance, green credit reflects banks' commitment to financing environmentally sustainable economic activities while managing long-term financial risks. According to the Otoritas Jasa Keuangan (OJK), expanding green credit is expected to accelerate the transition toward a low-carbon economy and strengthen the resilience of the national financial system. Nevertheless, the proportion of green financing remains relatively limited in many Indonesian banks, indicating that the implementation of sustainable lending practices is still developing (Sutrisno et al., 2024). From a financial perspective, green credit is expected to improve bank performance by expanding financing opportunities in sustainable sectors, enhancing corporate reputation, and reducing exposure to environmentally sensitive credit risks. Responsible lending practices may also contribute to better credit quality, thereby supporting lower Non-Performing Loans (NPL) and higher profitability (Siddikee et al., 2024). However, previous empirical studies have reported inconsistent findings. Sutrisno et al. (2024) documented a positive and significant relationship between green credit and profitability, whereas Ali Fata & Arifin (2024) reported a negative effect and Lalon et al. (2025) found no statistically significant relationship. These inconsistent findings indicate that the financial consequences of green credit remain inconclusive and require further empirical investigation within the Indonesian banking context.

In addition to green credit, Carbon Emission Disclosure (CED) has become an increasingly important indicator of corporate transparency and environmental accountability in the banking industry. According to Choi et al. (2013), Carbon Emission Disclosure refers to the voluntary disclosure of information related to carbon emissions, including the measurement, evaluation, and reporting of greenhouse gas emissions as well as strategies for mitigating climate change. Consequently, CED is no longer viewed merely as a disclosure requirement but also as a strategic mechanism for strengthening corporate legitimacy, improving stakeholder confidence, and enhancing long-term financial performance (Putri & Murtanto, 2023; Ratnawati, 2026). Despite its growing importance, empirical findings regarding the relationship between Carbon Emission Disclosure and profitability remain inconsistent. Osman et al. (2026), Ratnawati (2026), and Putri & Murtanto (2023) reported that broader carbon emission disclosure positively influences financial performance by enhancing corporate reputation and increasing stakeholder trust. In contrast, Al Idris et al. (2025) found that Carbon Emission Disclosure did not significantly affect profitability, indicating that the financial benefits of environmental disclosure may vary across institutional settings and firm characteristics. These inconsistent findings suggest that further empirical investigation is required to examine whether Carbon Emission Disclosure contributes to bank profitability within the Indonesian banking sector.

Non-Performing Loan (NPL) represents one of the most important indicators of credit risk in the banking industry. According to Tahu et al. (2025), NPL refers to the proportion of loans for which borrowers fail to meet their repayment obligations, including both principal and interest, in accordance with the agreed terms. In Indonesia, the Financial Services Authority (OJK) establishes a prudential threshold of 5% for the gross NPL ratio, making NPL a primary indicator of bank soundness and credit quality. A high NPL ratio increases provisioning costs, reflects weaker credit risk management, and ultimately reduces bank profitability and investor confidence (Rochman & Andayani, 2023). Therefore, maintaining credit quality through prudent lending practices and effective risk management is essential for preserving financial stability and improving bank performance (Sofyan et al., 2026; Buchory, 2024). Within the sustainable finance framework, NPL is expected to serve as an important transmission mechanism linking green credit to bank profitability. Banks that implement prudent green lending practices are expected to finance environmentally responsible

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projects with better long-term credit quality, thereby reducing credit risk and supporting higher profitability. However, previous empirical studies have produced inconsistent findings. Siddikee et al. (2024) reported that green finance significantly reduced Non-Performing Loans, whereas Budhathoki et al. (2025) found that green finance increased credit risk in the Nepalese banking industry. Likewise, Al-Qudah et al. (2023) documented a negative relationship between green lending and NPL. These inconsistent findings indicate that the role of NPL as a mediating mechanism remains inconclusive and requires further empirical examination, particularly in the Indonesian banking context.

Previous studies have extensively examined the relationships among green credit, carbon emission disclosure, Non-Performing Loans (NPL), and bank profitability. However, the empirical findings remain inconclusive. Studies on green credit have reported positive (Sutrisno et al., 2024), negative (Ali Fata & Arifin, 2024), and insignificant effects on profitability, while research on carbon emission disclosure has also produced inconsistent evidence across different institutional settings (Osman et al., 2026; Ratnawati, 2026 ; Al Idris et al., 2025). Similarly, previous studies investigating the relationship between green finance and Non-Performing Loans have reached conflicting conclusions, suggesting that the mechanisms through which sustainable finance influences bank performance remain insufficiently understood. In addition, most previous studies have examined these variables separately by focusing either on the direct effect of green credit on profitability, the impact of carbon emission disclosure on financial performance, or the relationship between green finance and credit risk. Limited attention has been given to developing an integrated framework that simultaneously examines the direct effects of Green Credit and Carbon Emission Disclosure on bank profitability while incorporating Non-Performing Loans as a mediating variable, particularly in the context of Indonesian conventional commercial banks listed on the Indonesia Stock Exchange. This limitation constitutes the primary research gap addressed in the present study.

Despite the growing body of literature on sustainable finance, previous studies have primarily examined the direct relationships among Green Credit, Carbon Emission Disclosure, Non-Performing Loans (NPL), and profitability separately. Empirical findings remain inconsistent, particularly regarding the effects of Green Credit on profitability, the influence of Carbon Emission Disclosure on financial performance, and the role of NPL as a mediating mechanism. Furthermore, limited evidence is available from Indonesian conventional commercial banks listed on the Indonesia Stock Exchange, where sustainable finance policies continue to evolve. Therefore, this study addresses these research gaps by proposing an integrated model that simultaneously examines Green Credit, Carbon Emission Disclosure, and Non-Performing Loans in explaining bank profitability. Based on the identified research gap, this study addresses the following research questions:

RQ1. Does Green Credit significantly influence bank profitability, as measured by Return on Assets (ROA)?
RQ2. Does Carbon Emission Disclosure significantly influence bank profitability (ROA)?
RQ3. Does Green Credit significantly influence Non-Performing Loans (NPL)?
RQ4. Do Non-Performing Loans significantly influence bank profitability (ROA)?
RQ5. Do Non-Performing Loans mediate the relationship between Green Credit and bank profitability (ROA)?

Accordingly, this study aims to examine the direct effects of Green Credit and Carbon Emission Disclosure on bank profitability, investigate the effect of Green Credit on Non-Performing Loans, examine the influence of Non-Performing Loans on profitability, and evaluate the mediating role of Non-Performing Loans in the relationship between Green Credit and bank profitability. By integrating sustainable lending practices, environmental disclosure, and credit risk within a single empirical framework, this study is expected to contribute to the sustainable finance literature and provide practical insights for banking management, regulators, and policymakers in strengthening the implementation of sustainable banking practices in Indonesia.

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II. Literature Review and Hypothesis Development

2.1. Legitimacy Theory

Legitimacy Theory, originally proposed by Suchman (1995), explains that organizational legitimacy consists of three dimensions: moral, cognitive, and pragmatic legitimacy. Moral legitimacy is achieved when organizational activities are perceived as ethically appropriate and consistent with prevailing social values and norms. Cognitive legitimacy exists when an organization's operations are widely accepted as natural and appropriate within society, whereas pragmatic legitimacy is obtained when organizational activities provide tangible benefits to stakeholders. This theoretical perspective was subsequently extended by Deegan et al. (2002) in the context of environmental accounting, arguing that organizations continuously seek to align their operations with societal expectations in order to maintain public acceptance and secure long-term organizational survival. In the banking industry, Legitimacy Theory explains that financial institutions are increasingly expected to integrate environmental sustainability into their operational strategies. Banks are evaluated not only by their financial performance but also by their commitment to sustainable development through initiatives such as Green Credit and Carbon Emission Disclosure. Green Credit demonstrates banks' commitment to financing environmentally responsible projects, while Carbon Emission Disclosure reflects transparency and accountability in managing environmental impacts. These practices strengthen banks' moral and cognitive legitimacy by aligning business operations with stakeholders' expectations and evolving environmental standards (Ali Fata & Arifin, 2024; Andrian & Kevin, 2021). From the perspective of pragmatic legitimacy, stakeholder support is essential for maintaining banking performance and organizational sustainability. By implementing Green Credit and transparently disclosing carbon emissions, banks strengthen stakeholder trust, enhance corporate reputation, and improve public confidence, ultimately contributing to higher financial performance (Kurniawan et al., 2025; Krisyadi et al., 2026). Therefore, Legitimacy Theory provides the theoretical foundation for explaining how Green Credit and Carbon Emission Disclosure are expected to improve bank profitability by strengthening organizational legitimacy within the Indonesian banking industry.

2.2. Stakeholder Theory

Stakeholder Theory, introduced by Freeman & McVea (1984), argues that organizations are responsible not only to shareholders but also to various stakeholder groups, including creditors, customers, employees, governments, investors, and society. Organizational sustainability depends on management's ability to balance the interests of these stakeholders through strategic decision-making. Donaldson & Preston (1995) further developed this theory by emphasizing that all stakeholders possess legitimate claims on organizations; therefore, managerial decisions should consider their interests rather than focusing solely on shareholder wealth. Within the banking industry, Stakeholder Theory explains that sustainable banking practices are implemented to respond to the expectations of both internal and external stakeholders. Green Credit represents banks' commitment to financing environmentally responsible projects, thereby supporting sustainable development while creating long-term value for stakeholders (Andaiyani et al., 2023). Accordingly, bank management is encouraged to allocate greater financial resources to green lending and environmentally friendly financial products because these initiatives contribute to environmental preservation, strengthen stakeholder relationships, and support sustainable business performance (Kuddus et al., 2026). Furthermore, Stakeholder Theory also explains the importance of Carbon Emission Disclosure as a mechanism for fulfilling stakeholders' demand for environmental transparency and accountability. Transparent disclosure of carbon emissions reduces information asymmetry, enhances the quality of sustainability reporting, and strengthens stakeholder trust in banking institutions (Pratiwi & Lastiati, 2023; Ratnawati, 2026). Consequently, the successful implementation of Green Credit and transparent Carbon Emission Disclosure is expected to strengthen stakeholder confidence, improve corporate reputation, and ultimately enhance bank profitability(Putri & Murtanto, 2023; Sutrisno et al., 2024).

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2.3. Profitability (ROA)

Profitability reflects a bank's ability to generate earnings from its business operations and serves as an important indicator of managerial effectiveness and financial performance. Several profitability ratios are commonly used in the banking industry, including Net Profit Margin (NPM), Return on Equity (ROE), and Return on Assets (ROA), each measuring different aspects of financial performance (Sa'adah et al., 2024). This study adopts Return on Assets (ROA) as the proxy for profitability because it comprehensively measures management's efficiency in utilizing total assets to generate net income. According to Hery (2020), ROA indicates the extent to which a company's assets contribute to earning profits, while Darmawan (2020) explains that ROA reflects management's capability to optimize assets financed by both equity and liabilities. Therefore, ROA is widely recognized as one of the most appropriate indicators for evaluating financial performance in the banking sector.

In the context of sustainable banking, profitability is influenced not only by financial efficiency but also by banks' ability to implement sustainability-oriented strategies. The implementation of Green Credit and transparent Carbon Emission Disclosure is expected to strengthen stakeholder trust, enhance corporate reputation, and improve financial performance through more sustainable business practices. Moreover, maintaining healthy asset quality, including effective management of Non-Performing Loans (NPL), enables banks to optimize profitability while reducing the risk of financial distress (Fitriawati et al., 2024; Yulyanti et al., 2022). Accordingly, ROA provides an appropriate measure for evaluating whether sustainable banking initiatives contribute to improving the financial performance of conventional commercial banks (Ross et al., 2019).

2.4. Green Credit

Green Credit refers to financing provided by financial institutions to support environmentally sustainable activities and facilitate the transition toward a low-carbon economy. In Indonesia, the implementation of Green Credit is regulated under Financial Services Authority Regulation (POJK) No. 51/POJK.03/2017, which requires financial institutions to integrate sustainability principles into their financing decisions by prioritizing projects that contribute to environmental protection, climate change mitigation, renewable energy, resource efficiency, and other sustainable business activities. Through this policy, banks are expected not only to achieve financial objectives but also to contribute to sustainable development and environmental responsibility.

From the perspectives of Legitimacy Theory and Stakeholder Theory, Green Credit represents a strategic instrument through which banks respond to increasing stakeholder expectations regarding sustainable finance while strengthening their legitimacy and corporate reputation. The implementation of Green Credit encourages environmentally responsible business practices, promotes long-term economic development, and supports the transition toward a sustainable economy (Harahap et al., 2024; Andaiyani et al., 2023). By financing environmentally friendly projects, banks can improve asset quality, expand sustainable investment opportunities, and enhance long-term financial performance, indicating that Green Credit has the potential to contribute positively to bank profitability (Sutrisno et al., 2024).

2.5. Carbon Emission Disclosure

Carbon Emission Disclosure (CED) refers to the voluntary disclosure of information regarding greenhouse gas emissions, climate-related risks, and emission reduction strategies undertaken by an organization (Choi et al., 2013). This disclosure enables companies to measure, evaluate, and communicate their environmental performance while demonstrating accountability for the environmental impacts of their business activities (Al Idris et al., 2025). In the banking industry, Carbon Emission Disclosure has become an important instrument for enhancing environmental transparency and communicating banks' commitment to

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sustainable finance and climate risk management. In Indonesia, carbon disclosure is commonly reported in sustainability reports based on the Global Reporting Initiative (GRI 305) or the disclosure index developed by Choi et al. (2013). In this study, the Carbon Disclosure Project (CDP)-based index proposed by Choi et al. (2013) is adopted because it provides a more comprehensive assessment of the breadth and quality of carbon-related disclosures.

From the perspectives of Legitimacy Theory and Stakeholder Theory, Carbon Emission Disclosure serves as a strategic mechanism through which banks strengthen legitimacy, reduce information asymmetry, and respond to stakeholders' increasing demand for environmental transparency. Comprehensive disclosure signals stronger environmental governance and demonstrates management's commitment to addressing climate-related risks, thereby enhancing stakeholder trust and corporate reputation (Krisyadi et al., 2026). As public confidence increases, banks are expected to attract greater stakeholder support, improve business sustainability, and strengthen financial performance. Therefore, higher levels of Carbon Emission Disclosure are expected to contribute positively to bank profitability (Putri & Murtanto, 2023).

2.6. Non-Performing Loan

Non-Performing Loan (NPL) is one of the primary indicators used to assess credit risk and asset quality in the banking industry. It represents the proportion of non-performing loans to total outstanding loans, reflecting a bank's ability to manage credit risk and maintain the quality of its loan portfolio (Yam, 2023). A higher NPL ratio indicates an increasing level of default risk, which may reduce interest income, increase loan loss provisions, and weaken overall financial performance (Fiana & Endri, 2025; Silpiani & Kusumawardani, 2025). In Indonesia, the Financial Services Authority (OJK) considers an NPL ratio below 5% as an indicator of a healthy banking condition, reflecting effective credit risk management and sound asset quality.

From the perspectives of Legitimacy Theory and Stakeholder Theory, maintaining a low NPL ratio demonstrates banks' capability to manage credit risk responsibly while safeguarding stakeholders' interests. Effective credit risk management enhances public confidence, strengthens institutional credibility, and supports sustainable banking operations. Conversely, a high NPL ratio increases financial losses, weakens profitability, and may reduce stakeholder confidence in the bank's financial stability (Al Idris et al., 2025). Therefore, NPL is expected to influence profitability directly and may also affect the extent to which sustainable banking initiatives, such as Green Credit and Carbon Emission Disclosure, contribute to financial performance.

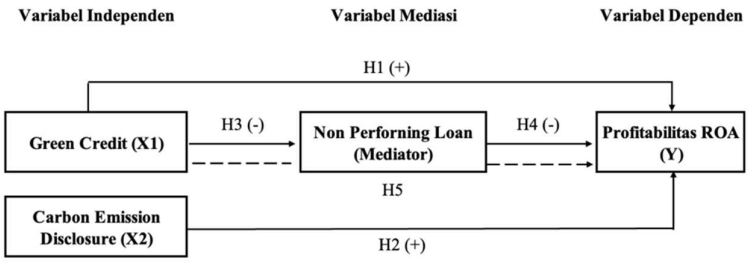

Figure 1. Research Conceptual Framework

Based on Legitimacy Theory, banks seek to maintain legitimacy by aligning their business activities with societal expectations regarding environmental sustainability. The implementation of Green Credit represents one of the banking industry's commitments to financing environmentally responsible projects while supporting sustainable economic development. By integrating environmental considerations into lending decisions, banks demonstrate accountability toward society and regulators, thereby strengthening institutional legitimacy and public trust. This legitimacy is expected to enhance corporate reputation, improve

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stakeholder confidence, and create long-term economic value, ultimately contributing to better financial performance. From the perspective of Stakeholder Theory, Green Credit also reflects banks' responsibility to meet the expectations of various stakeholders, including investors, regulators, customers, and society. The allocation of financing to sustainable projects is expected to reduce long-term environmental and credit risks while strengthening customer relationships and improving the quality of financing portfolios. Consequently, Green Credit is expected to support sustainable banking performance and enhance profitability through more responsible lending practices.

Based on Legitimacy Theory and Stakeholder Theory, the implementation of Green Credit enables banks to strengthen organizational legitimacy while responding to stakeholders' increasing expectations regarding sustainable finance. By financing environmentally responsible projects, banks demonstrate their commitment to sustainable development, enhance corporate reputation, and strengthen stakeholder trust. These benefits are expected to expand business opportunities, improve asset utilization, and generate sustainable income, ultimately leading to higher profitability as measured by Return on Assets (ROA). Previous empirical findings, however, remain inconclusive. Several studies reported that Green Credit positively affects bank profitability (Sutrisno et al., 2024; Li & Chen, 2024;Simanjorang & Leon, 2026),whereas other studies found insignificant or even negative effects (Andaiyani et al., 2023; Ali Fata & Arifin, 2024); (Han, 2025). The inconsistency of these findings indicates that the relationship between Green Credit and profitability remains open for further investigation, particularly within Indonesian conventional commercial banks operating under sustainable finance regulations. Therefore, the first hypothesis is proposed as follows:

Hypothesis 1 (H1): Green Credit has a positive effect on Profitability (ROA).

Based on Legitimacy Theory, Carbon Emission Disclosure (CED) enables banks to demonstrate environmental accountability and align their business operations with societal expectations regarding sustainability. Transparent disclosure of carbon emissions signals that banks actively manage climate-related risks and are committed to responsible environmental practices. Such transparency strengthens organizational legitimacy, reduces information asymmetry, enhances stakeholder trust, and improves corporate reputation. Consequently, stronger stakeholder confidence is expected to increase customer loyalty, attract investors, and improve operational performance, ultimately contributing to higher profitability as measured by Return on Assets (ROA). Previous empirical findings, however, remain mixed. Several studies reported that Carbon Emission Disclosure positively affects profitability (Ratnawati, 2026 ; Osman et al., 2026 ; Putri & Murtanto, 2023) whereas other studies found insignificant or negative effects (Situmorang & Yanti, 2020; Al Idris et al., 2025; Lee & Suhendah, 2026). These inconsistent findings indicate that the relationship between Carbon Emission Disclosure and profitability has not been conclusively established, particularly in the context of Indonesian conventional commercial banks implementing sustainable finance practices. Therefore, this study proposes the following hypothesis:

Hypothesis 2 (H2): Carbon Emission Disclosure has a positive effect on Profitability (ROA).

Based on Stakeholder Theory, banks are encouraged to allocate financing toward environmentally responsible projects in response to increasing stakeholder expectations for sustainable finance. The implementation of Green Credit generally involves more rigorous environmental and financial screening procedures, resulting in the selection of borrowers with stronger governance practices and more sustainable business models. Such financing is expected to improve loan quality, reduce credit risk, and strengthen banks' legitimacy by demonstrating prudent and responsible lending practices. Consequently, Green Credit is expected to contribute to lower Non-Performing Loan (NPL) ratios through better credit quality and more effective risk management (Zhou et al., 2022; Siddikee et al., 2024). Previous empirical studies, however, provide mixed evidence. Several studies found that Green Credit significantly reduces Non-Performing Loans by improving credit quality and mitigating credit risk (Zhou et al., 2022; Siddikee et al., 2024; Al-Qudah et al.,

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2023). In contrast, Kurniawan et al. (2025) reported that Green Credit did not significantly affect NPL in Indonesian banks, suggesting that the effectiveness of Green Credit in reducing credit risk may depend on differences in banking characteristics and implementation practices. Therefore, the relationship between Green Credit and Non-Performing Loans remains open for further investigation, particularly in the context of Indonesian conventional commercial banks. Accordingly, the following hypothesis is proposed:

Hypothesis 3 (H3): Green Credit has a negative effect on Non-Performing Loan.

Based on Stakeholder Theory, effective credit risk management is essential for maintaining banks' financial stability and fulfilling stakeholders' expectations for sustainable performance. A high Non-Performing Loan (NPL) ratio indicates deteriorating asset quality and requires banks to allocate larger loan loss provisions, thereby increasing operating expenses and reducing net interest income. Consequently, the decline in asset quality weakens banks' ability to utilize their assets efficiently, resulting in lower profitability as measured by Return on Assets (ROA). Therefore, maintaining a low NPL ratio is considered a fundamental strategy for preserving financial performance and ensuring long-term organizational sustainability. Previous empirical findings, however, remain inconsistent. Several studies reported that Non-Performing Loans negatively affect profitability because increasing credit risk reduces banks' earnings and operational efficiency (Rahmah et al., 2025; Buchory, 2024; Fiana & Endri, 2025). In contrast, Silpiani & Kusumawardani (2025) found no significant relationship between NPL and profitability. These inconsistent findings indicate that the impact of NPL on profitability remains inconclusive, particularly within the context of Indonesian conventional commercial banks. Therefore, the following hypothesis is proposed:

Hypothesis 4 (H4): Non-Performing Loan has a negative effect on Profitability (ROA).

Based on Legitimacy Theory, the implementation of Green Credit reflects banks' commitment to sustainable finance while responding to stakeholders' expectations for environmentally responsible business practices. Banks that consistently allocate financing to environmentally sustainable projects are expected to implement more prudent credit assessment and monitoring processes. Such practices improve loan portfolio quality, reduce credit risk, and strengthen banks' legitimacy among regulators, investors, and society. Consequently, lower Non-Performing Loan (NPL) ratios enable banks to reduce loan loss provisions, improve operational efficiency, and ultimately enhance profitability as measured by Return on Assets (ROA). Therefore, NPL is conceptually expected to serve as an important mechanism through which Green Credit influences bank profitability. Previous empirical findings regarding the mediating role of Non-Performing Loans remain inconclusive. Kurniawan et al. (2025) reported that NPL did not mediate the relationship between Green Credit and profitability because Green Credit failed to significantly influence either NPL or ROA. In contrast, Li & Chen (2024) found that Green Credit reduced credit risk through a risk mitigation mechanism, which subsequently improved bank profitability. These inconsistent findings indicate that the mediating role of NPL has not yet been firmly established, particularly within Indonesian conventional commercial banks implementing sustainable finance policies. Therefore, this study re-examines whether Non-Performing Loans function as a mediating variable in the relationship between Green Credit and Profitability (ROA).

Hypothesis 5 (H5): Non-Performing Loan mediates the effect of Green Credit on Profitability *(ROA).*

III. Research Method

This study employed a quantitative research approach with a causal research design to examine the direct and indirect relationships among Green Credit, Carbon Emission Disclosure (CED), Non-Performing Loans (NPL), and bank profitability measured by Return on Assets (ROA). A causal research design was selected because this study aims to empirically test the proposed hypotheses regarding the influence of Green Credit

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and Carbon Emission Disclosure on profitability, as well as the mediating role of NPL. The study utilized secondary panel data collected over the 2021–2025 observation period, combining cross-sectional data from conventional commercial banks listed on the Indonesia Stock Exchange (IDX) and time-series observations. The data were analyzed using panel data regression with the assistance of E-Views software. The analytical procedure included descriptive statistics, panel data model selection, classical assumption testing, hypothesis testing, and mediation analysis to provide empirical evidence regarding the relationships among the research variables.

Secondary data were obtained from the annual reports and sustainability reports of conventional commercial banks listed on the Indonesia Stock Exchange (IDX) during the 2021–2025 observation period. Financial information required to measure Return on Assets (ROA), Green Credit, and Non-Performing Loans (NPL), together with sustainability information used to assess Carbon Emission Disclosure (CED), was collected from these published reports. The study employed purposive sampling to select banks that consistently published the required reports and disclosed the information necessary to measure all research variables throughout the observation period. The population of this study consisted of all conventional commercial banks listed on the Indonesia Stock Exchange (IDX) during the 2021–2025 period. A purposive sampling technique was employed because not all listed banks disclosed the financial and sustainability information required to measure all research variables, particularly Green Credit and Carbon Emission Disclosure. The sampling criteria included: (1) conventional commercial banks listed on the IDX throughout the 2021–2025 period; (2) banks that consistently published annual reports and sustainability reports during the observation period; and (3) banks that disclosed Green Credit and Carbon Emission Disclosure information. Based on these criteria, the final sample consisted of 25 conventional commercial banks with a total of 125 firm-year observations.

Table 1. Sample Criteria (Purposive Sampling)

Criteria	Number of Banks
Conventional commercial banks listed on the IDX	49
Less: Banks without annual reports (2021–2025)	0
Less: Banks without sustainability reports (2021–2025)	-1
Less: Banks without Green Credit disclosure	-13
Less: Banks without Carbon Emission Disclosure	-10
Total Sample	**25**
Firm-year observations (2021–2025)	**125**

Return on Assets (ROA) was employed as the indicator of bank profitability. ROA gauges a bank's capacity to generate net income from its total assets and reflects management's effectiveness in utilizing available assets to maximize profitability (Hery, 2020; Darmawan, 2020)**.** ROA also represents the effectiveness of asset management in creating optimal returns (Ross et al., 2019; Yulyanti et al., 2022). In this study, ROA was measured by dividing net income after tax by total assets.

$$\text{ROA} = \frac{\text{Net Income}}{\text{Total Asset}}$$

Green Credit (GC) was employed as an independent variable in this study. Green credit refers to the proportion of a bank's total lending that is allocated to business activities supporting environmental preservation and sustainable development classified under the Sustainable Business Activities (KKUB or KUBL) (Andaiyani et al.,2023). In this study, Green Credit was measured as the ratio of green credit to total loans distributed by each bank.

$$\text{GC} = \frac{\text{Total Green Credit}}{\text{Total Credit}}$$

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Carbon Emission Disclosure (CED) was employed as an independent variable representing the extent of a bank's disclosure of carbon emission information. CED was measured using the disclosure index developed by (Choi et al., 2013) which consists of 18 disclosure items classified into five categories: Climate Change (CC), Greenhouse Gas Emissions (GHG), Energy Consumption (EC), Emission Reduction and Cost (RC), and Carbon Emission Accountability (AEC). Each disclosed item was assigned a score of one, whereas undisclosed items received a score of zero. The disclosure index was calculated by dividing the total disclosed items by the maximum number of disclosure items.

$$\text{CED} = \frac{\sum \text{Item Disclose}}{18}$$

Non-Performing Loans are loans in which borrowers fail to repay principal and interest according to the agreed contractual terms (Fauzan et al., 2023). Non-Performing Loan (NPL) was employed as the mediating variable representing bank credit risk. NPL reflects the proportion of non-performing loans relative to total loans extended by a bank and indicates the quality of its loan portfolio. A higher NPL ratio indicates greater credit risk exposure and poorer asset quality. In this study, NPL was measured by dividing non-performing loans by total loans.

$$\text{NPL} = \frac{\text{Non-performing Loans}}{\text{Total Loans}}$$

The data were analyzed using panel data regression with the assistance of E-Views software. The analytical procedure consisted of descriptive statistical analysis, panel data model selection, classical assumption testing, panel regression analysis, mediation analysis, and hypothesis testing. Descriptive statistical analysis was conducted to summarize the characteristics of each research variable using the mean, minimum, maximum, and standard deviation values. Panel data regression was employed because the dataset combines cross-sectional observations from conventional commercial banks and time-series observations covering the 2021–2025 period. Before estimating the regression model, panel data model selection was performed by evaluating three alternative estimation models: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The selection procedure consisted of the Chow test, Hausman test, and Lagrange Multiplier (LM) test. The final regression model was determined based on the results of these specification tests.

Prior to hypothesis testing, classical assumption tests were conducted to evaluate the adequacy of the regression model. Normality was assessed using the Jarque–Bera probability value, multicollinearity was evaluated using the Variance Inflation Factor (VIF), and heteroscedasticity was examined using the Breusch–Pagan–Godfrey test. The mediating role of Non-Performing Loans (NPL) was examined using the Sobel test. The Sobel test evaluates whether Green Credit exerts a statistically significant indirect effect on profitability through NPL by utilizing the regression coefficients and standard errors obtained from the structural regression models **(**Sobel, 1982). Hypothesis testing consisted of the coefficient of determination (Adjusted R^2), the F-test, and the t-test. Adjusted R^2 was used to evaluate the explanatory power of the regression model, the F-test assessed the simultaneous significance of the independent variables, and the t-test examined the partial effect of each independent variable on the dependent variable. Statistical significance was determined at the 5% significance level ($p < 0.05$).

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IV. Result and Discussion

4.1. Statistic Descriptive

Descriptive statistical analysis was conducted to provide an overview of the characteristics and distribution of the research variables based on 125 firm-year observations. The descriptive statistics present the minimum, maximum, mean, and standard deviation values of each variable. The mean represents the average value of each variable during the observation period, whereas the minimum and maximum values indicate the range of observations. The standard deviation reflects the degree of variation in each variable across the sampled banks.

Table 2. Descriptive Statistical Analysis

Variable	Mean	Std. Dev.	Min	Max
ROA	0,01599	0,02101	-0,13710	0,04910
GC	0,21269	0,17227	0,00002	0,67500
CED	0,59333	0,27756	0,11110	1,00000
NPL	0,02396	0,01217	0,00010	0,07990

Table 2 presents the descriptive statistics of the research variables. Return on Assets (ROA) represents the profitability of the sampled banks, while Green Credit (GC), Carbon Emission Disclosure (CED), and Non-Performing Loans (NPL) represent the independent and mediating variables examined in this study. The descriptive statistics indicate that all variables exhibit variation across banks and observation years, reflecting differences in financial performance, sustainability practices, and credit risk management among conventional commercial banks listed on the Indonesia Stock Exchange during the 2021–2025 period. The mean ROA of 1.59% indicates that, on average, sample banks generated a net return of 1.59% on total assets during the 2021–2025 period, with a standard deviation of 0.0210. The wide range between the maximum 4.91% by Allo Bank Indonesia Tbk, 2025 and minimum -13.71% by Bank Neo Commerce Tbk, 2021 reflects substantial disparity in financial performance across the sample. The mean green credit ratio of 21.27% indicates that, on average, sample banks channeled approximately one-fifth of their total credit toward green sectors. The wide gap between the maximum 67.5% by Bank Rakyat Indonesia, 2022 and minimum 0.002% by Bank Neo Commerce Tbk, 2025, alongside a standard deviation of 0.1723, highlights significant heterogeneity in green credit commitment across banks.

The mean CED of 59.33% indicates that sample banks disclosed more than half of the 18-reference carbon emission disclosure items on average. Full disclosure (100%) was achieved by Bank Negara Indonesia (2025), Bank Central Asia (2025), and Bank Mandiri (2023), while the minimum of 11.11% by Bank Bumi Artha, 2021 and a standard deviation of 0.2776 reflect considerable variation in disclosure practices across the sample. The mean NPL of 2.40% indicates that, on average, sample banks-maintained credit quality within OJK's prudential threshold of ≤5% throughout the observation period. The narrow standard deviation of 0.0122 suggests relatively homogeneous credit risk levels across banks, although the maximum NPL of 7.99% by Bank Sinarmas, 2022 indicates that at least one bank temporarily exceeded the regulatory safety threshold, in contrast to the near-zero minimum recorded by Allo Bank Indonesia (2022).

4.2. Model Selection Test

a. Chow Test

The Chow test was conducted to determine whether the Common Effect Model (CEM) or the Fixed Effect Model (FEM) was more appropriate for estimating the panel regression model. The test compares the pooled regression model with the fixed-effects specification to identify whether individual cross-sectional effects should be considered.

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Table 3. Chow Test

Effects Test	Statistic	d.f.	Prob.
Cross-section F	3,6948	(24,97)	0.0000
Cross-section Chi-square	81,1612	24	0.0000

As presented in Table 3, both the Cross-section F probability value (0.0000) and the Cross-section Chi-square probability value (0.0000) are below the 5% significance level. Therefore, the null hypothesis is rejected, indicating that the Fixed Effect Model provides a better estimation than the Common Effect Model.

b. Hausman Test

After selecting the Fixed Effect Model through the Chow test, the Hausman test was performed to compare the Fixed Effect Model (FEM) and the Random Effect Model (REM). The objective of this test is to determine the most appropriate estimation model for hypothesis testing.

Table 4. Hausman Test

Test Summary	Statistic	d.f.	Prob.
Cross-section random	13,5537	3	0,0036

Table 3 shows that the Hausman test probability value is 0.0036, which is below the significance level of 0.05. Therefore, the Fixed Effect Model was selected as the final estimation model for this study.

4.3. Classical Assumption Test

a. Normality Test

The normality test was conducted to examine whether the residuals of the estimated regression model followed a normal distribution. Residual normality is an important assumption for ensuring the validity of statistical inference in regression analysis.

Table 5. Normality Test

Jarque-Bera	4,9177
Probability	0,0855

The Jarque–Bera probability value of 0.0855 exceeds the 0.05 significance level, indicating that the residuals are normally distributed. Therefore, the regression model satisfies the normality assumption.

b. Multicollinearity Test

The multicollinearity test was conducted to examine whether high correlations existed among the independent variables included in the regression model. Multicollinearity was evaluated using the Variance Inflation Factor (VIF), where values below 10 indicate the absence of multicollinearity.

Table 6. Multicollinearity Test

Variabel	Centered VIF
GC	1.076520
CED	1.087028
NPL	1.011948

As shown in Table 6, all VIF values are substantially below the threshold value of 10. These results indicate that multicollinearity is not present among the independent variables, suggesting that the regression coefficients can be estimated reliably.

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c. Heteroscedasticity Test

The heteroscedasticity test was performed using the Breusch–Pagan–Godfrey procedure to determine whether the residual variance remained constant across observations. A probability value greater than 0.05 indicates that the regression model satisfies the homoscedasticity assumption.

Table 7. Heteroscedasticity Test

F-statistic	2.06269	Obs*R-squared	6.08161
Prob. F-statistic	0.10870	Prob. Chi-Square (3)	0.10770

Table 7 indicates that both the Prob. F-statistic (0.1087) and the Prob. Chi-Square (0.1077) exceed the significance level of 0.05. Therefore, the regression model is free from heteroscedasticity and satisfies the homoscedasticity assumption.

4.4. Sobel Test

The Sobel test was conducted to examine whether Non-Performing Loans (NPL) significantly mediate the relationship between Green Credit and bank profitability (ROA). The Sobel test evaluates the significance of the indirect effect based on the regression coefficients and standard errors obtained from the structural regression models.

Table 8. Sobel Test

Mediation Test	Statistic	Std Error	p-value
Uji Sobel	3,829758	0,00560611	0,000128

As presented in Table 8, the Sobel test statistic is 3.829758 with a probability value of 0.000128. Since the probability value is below the 5% significance level, the indirect effect is statistically significant. These findings indicate that Non-Performing Loans (NPL) significantly mediate the relationship between Green Credit and bank profitability.

4.5. Hypothesis Testing

Table 9. Results of Structure Hypothesis Test 1

Variable	Coeff	Std. Error	t-Statistic	Prob. (2-Tiled)	Prob. (1-Tiled)	Description
C	0.0235	0.0015	15.8083	0.0000	0.0000	
GC	-0.0339	0.0053	-0.0635	0.9495	0.4747	H3 Rejected
Adj R-squared	0.3040					
Prob(F-statistic)	0.0000					

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The direct impact of the independent variable Green Credit (GC) on the mediating variable Non-Performing Loan (NPL) is investigated in this structure. According to the model described in the preceding chapter, the regression equation utilized to test the hypothesis is as follows:

$$NPL = 0.0234 - 0.0339\ GC$$

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Table 10. Results of Structure Hypothesis Test 2

Variable	Coeff	Std. Error	t-Statistic	Prob. (2 tiled)	Prob. (1 tiled)	Description
C	0.01505	0.00528	2.84794	0.00520	0.00260	
GC	0.03321	0.00960	3.45751	0.00080	0.00040	H1 Accepted
CED	0.01525	0.00599	2.54546	0.01220	0.00610	H2 Accepted
NPL	-0.63292	0.13180	-4.80227	0.00000	0.00000	H4 Accepted
Adj R-squared	0.285677					
Prob(F-statistic)	0.000000					

This structure looks at how the dependent variable Return on Assets (ROA) is directly impacted by the independent variables Green Credit (GC), Carbon Emission Disclosure (CED), and the mediating variable Non-Performing Loan (NPL). According to the model described in the preceding chapter, the following regression equation was utilized to evaluate the hypotheses:

$$\mathbf{ROA = 0.0150 + 0.0332\ GC + 0.0152\ CED - 0.6329\ NPL}$$

a. Coefficient of Determination (Adjusted R^2)

The coefficient of determination (Adjusted R^2) was used to evaluate the explanatory power of the estimated regression models. Since the Fixed Effect Model (FEM) was selected as the final estimation model, the Adjusted R^2 value provides a more appropriate measure of model fit by considering the number of explanatory variables included in the model. In Structural Model 1, the Adjusted R-squared value of 0.3040 indicates that Green Credit explains 30.40% of the variation in Non-Performing Loans (NPL), while the remaining 69.60% is explained by other variables not included in this study. Meanwhile, in Structural Model 2, the Adjusted R-squared value of 0.2857 indicates that Green Credit, Carbon Emission Disclosure, and Non-Performing Loans jointly explain 28.57% of the variation in Return on Assets (ROA), whereas the remaining 71.43% is attributable to other factors outside the research model. These findings suggest that although the proposed model has acceptable explanatory power, bank profitability and credit risk are also influenced by additional financial, operational, and macroeconomic factors beyond the scope of this study.

b. F-Test

The F-test was conducted to evaluate whether the independent variables jointly exert a statistically significant effect on the dependent variables. This test determines the overall significance of the regression model before interpreting the individual regression coefficients. The results indicate that the probability values of the F-statistics for both structural models are below the significance level of 0.05. Therefore, the regression models are statistically significant, indicating that the independent variables collectively explain variations in Non-Performing Loans (NPL) and Return on Assets (ROA). Consequently, both regression models are considered appropriate for subsequent hypothesis testing and interpretation of the individual regression coefficients.

c. T-Test

The t-test was performed to examine the partial effect of each independent variable on the dependent variables. Statistical significance was determined using a significance level of 5%, where probability values below 0.05 indicate statistically significant relationships between the variables. The regression results indicate that Green Credit has a positive and statistically significant effect on Return on Assets (ROA). The positive regression coefficient indicates that an increase in Green Credit is associated with higher bank profitability. Therefore, Hypothesis 1 is accepted. The regression results demonstrate that Carbon Emission Disclosure has a positive and statistically significant effect on Return on Assets (ROA). This finding indicates that banks with more extensive carbon emission disclosure tend to exhibit better financial performance. Therefore, Hypothesis 2 is accepted.

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Hypothesis 3 proposed that Green Credit has a negative effect on Non-Performing Loans (NPL). The regression results indicate a coefficient of -0.033922 with a probability value of 0.474750, which exceeds the 5% significance level. Therefore, Green Credit does not have a statistically significant effect on Non-Performing Loans (NPL), and Hypothesis 3 is rejected. The regression analysis indicates that Non-Performing Loans (NPL) have a negative and statistically significant effect on Return on Assets (ROA). The negative regression coefficient implies that increasing credit risk reduces bank profitability, indicating that higher levels of non-performing loans weaken banks' ability to generate returns from their assets. Therefore, Hypothesis 4 is accepted.

4.6. Discussion

a. The Impact of Green Credit on Profitability (Return on Assets)

According to Stakeholder Theory, banks that actively implement green credit demonstrate their commitment to balancing financial objectives with the interests of regulators, investors, customers, and society. The allocation of financing to environmentally responsible sectors is expected to strengthen stakeholder trust, improve corporate reputation, and support long-term financial performance. From the perspective of Legitimacy Theory, green credit also represents banks' efforts to align their business activities with environmental regulations and societal expectations, thereby strengthening organizational legitimacy and sustaining business continuity. The empirical findings of this study support these theoretical perspectives by showing that Green Credit has a positive and statistically significant effect on Return on Assets (ROA). This finding indicates that increasing the proportion of green credit contributes to higher bank profitability. The result suggests that sustainable financing not only fulfills environmental responsibilities but also creates economic benefits by improving stakeholder confidence and supporting banks' long-term business performance.

The findings are consistent with Li & Chen (2024), Sutrisno et al. (2024), and Simanjorang & Leon (2026), who also reported that Green Credit positively affects bank profitability. These studies suggest that banks implementing sustainable financing are more likely to improve financial performance through stronger stakeholder support and enhanced competitiveness. However, the findings differ from Ali Fata & Arifin (2024) who reported a negative relationship between Green Credit and profitability, and from Lalon et al. (2025), who found no significant relationship between the two variables. These differences indicate that the impact of Green Credit on profitability may vary across countries and banking systems depending on the level of sustainable finance implementation and institutional conditions. In the Indonesian banking context, the positive effect observed in this study may reflect the gradual implementation of sustainable finance policies that encourage banks to integrate environmental considerations into their financing activities. As sustainable finance practices continue to develop, Green Credit can become an important strategy for improving both environmental responsibility and financial performance. Therefore, the findings provide empirical support that expanding Green Credit may contribute not only to sustainable development objectives but also to improving bank profitability in Indonesia.

b. The Effect of Carbon Emission Disclosure on Profitability (Return on Assets)

Based on Legitimacy Theory, banks that actively disclose carbon emission information seek to demonstrate that their operational activities are aligned with societal expectations regarding environmental sustainability. Such disclosure strengthens stakeholder trust, enhances corporate reputation, and supports financial performance as reflected in Return on Assets (ROA) (Tari & Wahyuningrum, 2026); Ratnawati, 2026). The empirical findings of this study indicate that Carbon Emission Disclosure has a positive and statistically significant effect on profitability (ROA). This finding suggests that more transparent disclosure of carbon emission information contributes to better financial performance. By providing broader environmental information, banks reduce information asymmetry, strengthen public confidence, and demonstrate

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accountability regarding sustainability practices, thereby improving their reputation among investors and other stakeholders.

These findings are consistent with Osman et al. (2026), Ratnawati (2026), and Putri & Murtanto (2023), who reported that broader and higher-quality carbon emission disclosure is associated with stronger financial performance. The results suggest that transparent environmental disclosure is increasingly viewed as a strategic asset capable of strengthening market confidence and supporting profitability. However, the findings differ from Al Idris et al. (2025), who reported that Carbon Emission Disclosure did not significantly affect profitability, indicating that the economic benefits of environmental disclosure may vary depending on firm characteristics, industry conditions, and the maturity of sustainability implementation. Within the Indonesian banking context, the positive relationship observed in this study may reflect the strengthening of sustainable finance implementation and mandatory sustainability reporting encouraged by the Financial Services Authority (OJK). Banks that disclose carbon emission information more comprehensively are more likely to gain investor confidence, improve access to sustainable financing opportunities, and strengthen their competitiveness. Consequently, Carbon Emission Disclosure functions not only as an environmental accountability mechanism but also as a strategic instrument for enhancing bank profitability.

c. The Impact of Green Credit on Non-Performing Loans (NPL)

According to legitimacy theory, banks that implement sustainable and responsible financing are expected to maintain the quality of their loan portfolios in order to preserve public trust and organizational legitimacy. Likewise, stakeholder theory suggests that the distribution of green credit should be accompanied by prudent credit risk management to meet the expectations of regulators, investors, and society (Kurniawan et al., 2025; Andriani, 2023). However, the empirical findings of this study indicate that Green Credit does not have a statistically significant effect on Non-Performing Loans (NPL). Although the estimated regression coefficient is negative, the relationship is not statistically significant, indicating that the expected reduction in credit risk through Green Credit has not yet been empirically confirmed during the observation period. These findings are consistent with Kurniawan et al. (2025), who reported that Green Credit did not significantly affect Non-Performing Loans because the proportion of green lending remained relatively small compared with total bank lending, limiting its influence on overall credit quality. However, the findings differ from Siddikee et al. (2024), Al-Qudah et al. (2023) and Zhou et al. (2022), who found that Green Credit significantly reduced credit risk and non-performing loans.

In the Indonesian banking context, this insignificant relationship may be explained by the fact that Green Credit has not yet become a dominant component of banks' lending portfolios. Furthermore, during the post-pandemic recovery period, movements in Non-Performing Loans were influenced not only by lending policies but also by credit restructuring programs, sectoral recovery following the COVID-19 pandemic, and OJK relaxation policies. These conditions may have reduced the observable impact of Green Credit on credit risk during the 2021–2025 observation period. Therefore, although Green Credit is conceptually expected to improve loan quality and reduce credit risk, the present findings indicate that its implementation in Indonesian commercial banks has not yet generated a statistically significant reduction in Non-Performing Loans. This suggests that the effectiveness of Green Credit in reducing credit risk may require a larger proportion of sustainable lending and a longer implementation period before its impact becomes observable.

d. The Impact of Non-Performing Loans on Profitability (Return on Assets)

ccording to stakeholder theory, effective credit risk management is essential for maintaining stakeholder confidence and supporting sustainable financial performance. A high level of Non-Performing Loans (NPL) reflects deteriorating credit quality, increases loan loss provisioning, and reduces banks' ability to generate profits. Consequently, maintaining low NPL levels is considered an important responsibility in fulfilling the expectations of shareholders, regulators, and other stakeholders (Akhdan et al., 2025). The empirical findings of this study indicate that Non-Performing Loans have a negative and statistically significant

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effect on Return on Assets (ROA). This finding suggests that an increase in credit risk directly reduces bank profitability because a larger proportion of non-performing loans increases provisioning expenses, decreases interest income, and weakens the efficiency of asset utilization. As a result, maintaining good credit quality remains an important determinant of bank financial performance.

These findings are consistent with Buchory (2024), Rahmah et al. (2025) and Fiana & Endri (2025), who also reported that higher NPL levels significantly reduce bank profitability. However, the findings differ from Khamisah et al. (2020), who found no significant relationship between NPL and ROA. These differences indicate that the influence of credit risk on profitability may vary depending on banking conditions, economic environments, and the observation period used in each study. In the Indonesian banking context, the negative relationship between NPL and profitability remains relevant despite the implementation of post-pandemic credit restructuring policies. Although these policies helped prevent a substantial increase in problem loans during the recovery period, higher NPL levels continued to reduce banks' profitability. This finding confirms that effective credit risk management remains essential for maintaining financial stability and improving bank performance.

e. Non-Performing Loan (NPL) mediates the effect of Green Credit (GC) on Profitability (Return on Assets)

According to stakeholder theory, banks are expected to implement Green Credit while maintaining prudent credit risk management to meet the expectations of investors, regulators, and society. In this perspective, sustainable lending should be accompanied by careful debtor selection, continuous monitoring, and effective credit risk control to preserve asset quality. Therefore, Non-Performing Loans (NPL) are theoretically expected to serve as a mediating mechanism through which Green Credit influences bank profitability (Sriyono & Nabellah, 2022). The empirical findings partially support this theoretical expectation. The direct relationship between Green Credit and Non-Performing Loans is statistically insignificant, indicating that Green Credit has not yet demonstrated a direct effect on reducing credit risk during the observation period. However, Non-Performing Loans have a significant negative effect on Return on Assets, indicating that credit quality remains an important determinant of bank profitability.

Although one segment of the mediation pathway is statistically insignificant, the Sobel test indicates a significant indirect effect of Green Credit on profitability through Non-Performing Loans. These findings suggest that NPL functions as a mediating variable in the relationship between Green Credit and profitability, supporting Hypothesis 5. Therefore, improvements in sustainable lending practices may contribute to profitability through better credit quality, even though the direct influence of Green Credit on NPL has not yet been statistically observable during the study period. This finding may be explained by the relatively early stage of Green Credit implementation in Indonesian banking, where the proportion of sustainable lending remains limited within the overall loan portfolio. In addition, post-pandemic credit restructuring policies and OJK relaxation measures may have reduced the observable influence of Green Credit on Non-Performing Loans during the 2021–2025 observation period. Nevertheless, the significant indirect effect suggests that strengthening sustainable lending policies together with effective credit risk management may contribute to improving long-term bank profitability.

V. Conclusion

This study aimed to examine the effects of Green Credit and Carbon Emission Disclosure on bank profitability, proxied by Return on Assets (ROA), with Non-Performing Loans (NPL) acting as a mediating variable in conventional commercial banks listed on the Indonesia Stock Exchange during the 2021–2025 period. Overall, the findings indicate that sustainable finance practices contribute to improving bank profitability, although their influence differs across the examined relationships. The empirical results demonstrate that Green Credit and Carbon Emission Disclosure have positive and significant effects on profitability (ROA), indicating that the implementation of sustainable financing and environmental

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transparency can strengthen banks' financial performance. Meanwhile, Green Credit does not significantly reduce Non-Performing Loans (NPL), suggesting that the expansion of green credit alone is not sufficient to directly improve credit quality. In contrast, NPL has a significant negative effect on profitability, confirming that effective credit risk management remains an essential determinant of bank financial performance. Furthermore, the mediation analysis shows that NPL serves as a mediating mechanism in the relationship between Green Credit and profitability. From a theoretical perspective, these findings support Legitimacy Theory and Stakeholder Theory by demonstrating that sustainable banking practices strengthen organizational legitimacy, respond to stakeholder expectations, and improve financial performance through more effective credit risk management. Practically, the findings imply that banks should not only expand Green Credit portfolios and enhance Carbon Emission Disclosure but also integrate prudent credit risk management into sustainable finance strategies to maximize long-term profitability.

This study has several limitations that should be considered when interpreting the findings. First, the observation period (2021–2025) coincided with the implementation of COVID-19 credit restructuring policies, which may have prevented the Non-Performing Loan (NPL) ratio from fully reflecting the actual quality of bank loan portfolios. Consequently, the relationship between credit risk and profitability may not entirely represent normal banking conditions. Second, the measurement of Carbon Emission Disclosure relied on an index developed in previous studies, which may not fully capture recent developments in sustainability reporting standards. As sustainability disclosure frameworks continue to evolve, the measurement employed in this study may not comprehensively represent current environmental reporting practices.

This study provides several implications for academics, banking practitioners, and investors. For academics, the findings enrich the sustainable finance literature by providing empirical evidence regarding the relationships among Green Credit, Carbon Emission Disclosure, Non-Performing Loans, and profitability within the Indonesian banking sector. The study also highlights the importance of integrating sustainability and credit risk management perspectives in future banking research. For investors and other stakeholders, the results suggest that Green Credit and Carbon Emission Disclosure can serve as additional indicators of banks' long-term sustainability and financial performance. Nevertheless, investment decisions should also consider other financial fundamentals, including asset quality, capital adequacy, and operational efficiency. For bank management, the findings indicate that sustainable finance initiatives should be integrated with comprehensive credit risk management. Expanding Green Credit portfolios should be accompanied by prudent borrower selection, effective monitoring systems, and sound risk assessment to ensure that sustainability initiatives generate both environmental and financial benefits. Future studies are encouraged to extend the observation period beyond the post-pandemic restructuring era to capture more stable banking conditions. Researchers are also advised to incorporate additional control variables, such as bank size, operational efficiency, capital structure, and macroeconomic indicators, to obtain a more comprehensive understanding of bank profitability. Furthermore, future studies should adopt more recent sustainability reporting standards or updated carbon disclosure indices to better reflect current environmental reporting practices and regulatory developments.

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