EXAMINING THE ROLE OF RISK MANAGEMENT IN LINKING SUSTAINABILITY TO FINANCIAL DISTRESS IN BANKS

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Abstract

This study investigates the impact of sustainability and risk management on financial distress among banks listed by the Financial Services Authority (OJK) during the 2020–2023 period. Sustainability is represented by Green Loans, while risk management is measured using the Capital Adequacy Ratio (CAR). A quantitative explanatory approach with Structural Equation Modeling (SEM) is used to examine both direct and indirect relationships between variables. The findings reveal that Green Loans do not have a significant direct effect on financial distress but significantly influence risk management. Additionally, risk management does not directly affect financial distress but serves as an intervening factor that enhances the influence of sustainability on financial distress. The practical implication highlights the need to strengthen the integration of sustainability within risk management frameworks to support financial resilience in the banking sector. This study offers both theoretical and practical insights for enhancing banking risk management and informs policy recommendations for regulators, financial institutions, and future researchers.

Keywords: Financial Distress, Sustainability, Green Loans, Risk Management

1. INTRODUCTION

The banking sector holds a vital position in supporting Indonesia's economic development. Acting as a financial intermediary, banks channel funds from surplus to deficit sectors, thereby facilitating capital flows that sustain economic activity and financial stability. The banking industry also contributes to national development by financing public needs, corporate activities, and strategic infrastructure projects (Rohman Abdul, 2023; Kompasiana, 2023; Dwi Ceysa et al., 2024).

Despite its importance, the sector is not free from risk, especially the potential for financial distress, which refers to a bank's declining ability to fulfill its short term financial obligations (Goh, 2023). Factors such as weak cash flow, operational inefficiency, and limited access to external funding contribute to the vulnerability of banks to distress.

One area gaining attention in recent years is the integration of sustainability principles into banking operations. Specifically, green loans financing directed toward environmentally sustainable projects are considered an important strategy to support long term financial health. However, the adoption of green financing instruments in Indonesia remains relatively low compared to other ASEAN countries (ASEAN Catalytic Green Finance Facility, 2023). This gap raises concerns about the sector's resilience to future risks, particularly under increasing environmental and regulatory pressure (Meutia, 2020; Adriyani et al., 2024).

To assess a bank's vulnerability to financial distress, models such as the Altman Z-Score are often used,

which help predict bankruptcy likelihood based on financial performance indicators (Rahmat, 2020). During the COVID-19 pandemic, many banks experienced pressure due to economic contraction, rising operational costs, and interest margin compression (KNEKS, 2020; Bank Indonesia, 2023). While short term measures such as credit restructuring provided temporary relief, long term solutions depend on how effectively banks manage risks, especially in integrating sustainability strategies.

In 2024, the Financial Services Authority (OJK) issued climate risk guidelines to support sustainability linked banking practices. Major institutions like Bank Negara Indonesia and Bank DBS Indonesia have begun to disburse large volumes of green and transition financing, demonstrating a growing commitment to sustainability. However, effective risk management, proxied by the Capital Adequacy Ratio (CAR), is still crucial to ensure that such initiatives contribute meaningfully to long term financial stability.

Given this context, it is essential to explore whether green loans, as part of sustainability practices, can reduce financial distress and how CAR acts as an intermediary in this relationship. Understanding this dynamic provides valuable insights into how banks can balance profitability, risk, and sustainability.

Problem Identification

Based on the background above, the key issues identified in Indonesia's banking sector include:

a. Low adoption of sustainability oriented financing such as green loans.
b. The need for strong risk management practices (measured by CAR) to mitigate the impact of sustainability on financial distress.

Scope of the Study

This study focuses on:

a. Sustainability, represented by green loans.
b. Risk management, represented by the Capital Adequacy Ratio (CAR).
c. Financial distress as the outcome variable.
d. The direct and indirect relationship between green loans and financial distress through CAR.

Research Questions

a. Do green loans affect financial distress?
b. Do green loans affect CAR?
c. Does CAR affect financial distress?
d. Do green loans affect financial distress through CAR?

Research Objectives

This study aims to explain and analyze:

a. The effect of green loans on financial distress.
b. The effect of green loans on CAR.
c. The effect of CAR on financial distress.
d. The effect of green loans on financial distress through CAR.

Significance of the Study

1. Theoretical Contributions

a. Enrich the literature on the relationship between sustainability, risk management, and financial distress.
b. Develop an analytical model using CAR as an intervening variable.
c. Strengthen the theoretical understanding of sustainability integration in the banking sector.

2. Practical Contributions

a. Provide insights for bank managers to enhance risk and sustainability strategies.

b. Support regulators in designing effective banking policies.
c. Help investors and stakeholders make better financial decisions.
d. Raise public awareness about the importance of banking system stability.
e. Serve as a reference for future researchers in related topics.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

a. Theoretical Background

This study is grounded in Agency Theory, as proposed by Jensen & Meckling (1976) which explains the potential conflicts of interest between principals (owners) and agents (managers). In the context of banking, risk management becomes a strategic mechanism to align interests and mitigate agency costs that arise when managers pursue short term goals at the expense of long term sustainability. Effective risk management, such as maintaining optimal capital levels, can ensure that managerial decisions align with the long term health and stability of financial institutions.

The core issue addressed in this study is financial distress, defined as the inability of a company to meet its short term obligations (Goh, 2023). Several models have been developed to predict financial distress, such as the Altman Z-score, the Springate Model, and the Zmijewski Model. These models rely on various financial ratios to assess a firm's likelihood of bankruptcy and have been widely used in banking research (Goh, 2023; Fachruddin in Goh, 2023; Fahmi, 2023).

b. Sustainability

Sustainability in banking refers to the integration of environmental, social, and governance (ESG) considerations into financial decision making. One practical application is the issuance of green loans, which fund environmentally friendly projects. Green loans are often supported by lower interest rates and are viewed as a vehicle for achieving long term environmental goals while enhancing financial stability (Ali et al., 2023; Fdhila, 2024).

Green loans have been shown to reduce financial distress by lowering the proportion of non performing loans (NPLs) and enhancing the solvency of banks (Ali et al., 2023). Furthermore, ESG disclosures are associated with lower distress risk and higher firm value (Adriyani et al., 2024), while ESG indicators have improved the accuracy of financial distress prediction models (Citterio & King, 2023). However, most prior studies have treated ESG holistically and lacked specific attention to green loans as a direct and measurable sustainability proxy.

c. Risk Management in Banking

Risk management refers to the systematic process of identifying, measuring, monitoring, and controlling risks (POJK, 2016). In the banking sector, Capital Adequacy Ratio (CAR) serves as a key indicator of a bank's ability to absorb losses. CAR reflects a bank's resilience and is central to regulatory frameworks globally. According to Sudarmanto (2021), effective risk management involves not only technical assessments but also organizational culture and governance mechanisms.

Risk in banking spans several domains, including credit risk, operational risk, market risk, and reputation risk (Lis Sintha Oppusunggu, 2021). CAR, Loan to Deposit Ratio (LDR), and BOPO (Operating Expense Ratio) are among the most commonly used financial metrics in assessing risk and performance (Ikatan Bankir Indonesia, 2015; Oppusunggu, 2021).

d. Research Gap

Despite numerous studies on sustainability and financial distress, there is a lack of integrative models that examine how sustainability initiatives such as green loans affect financial distress through risk management mechanisms (Ani Nur Fadilah et al., 2024; Adriyani et al., 2024; Mirovic et al., 2023; Ecole, 2020). Moreover, while ESG has been studied broadly, the direct measurement of green loans and their interaction with CAR as a proxy for risk management remains limited, especially in the

Indonesian banking context.
This study fills that gap by proposing an intervening model, where risk management (CAR) mediates the relationship between sustainability (green loans) and financial distress (measured using Z-score). The study uses empirical data from 2020–2023, a critical period for banking recovery following the COVID-19 pandemic.

e. Hypothesis Development

H1: Sustainability has a significant effect on financial distress.
Green loans reduce credit risk and enhance bank solvency (Ali et al., 2023). ESG practices decrease financial distress and increase firm value (Adriyani et al., 2024), and ESG based models improve prediction accuracy of bankruptcy (Citterio & King, 2023).

H2: Sustainability has a significant effect on risk management.
Green loans strengthen banks' capital positions and moderate the relationship between liquidity and profitability (Dafermos & Nikolaidi, 2021; Mirovic et al., 2023). Banks with higher CAR are more capable of channeling green loans while maintaining risk resilience.

H3: Risk management has a significant effect on financial distress.
Higher CAR reduces the likelihood of distress (Kareem et al., 2022). Effective risk management is positively related to bank reputation and reduces financial vulnerability (Ragil et al., 2024). Governance factors also influence financial distress (Lestari & Wahyudin, 2021).

H4: Sustainability affects financial distress through risk management.
Green financing enhances risk management, especially in state owned banks (Liu & Huang, 2022). In Indonesia, green loans positively impact profitability regardless of capital adequacy or credit risk (Sutrisno & Furqan, 2023). Green loans also reduce credit risk and improve bank performance (Neagu et al., 2024).

f. Novelty

This study contributes to the literature by:
1) Introducing green loans as a direct proxy for sustainability, which is rarely used in Indonesian banking research.
2) Developing a mediating model, in which CAR (risk management) intervenes between sustainability and financial distress, offering a more comprehensive analytical framework.
3) Focusing on the post pandemic recovery period (2020–2023), which provides fresh empirical insights into how Indonesian banks are coping with sustainability pressures and financial vulnerabilities.

This model can support regulators and practitioners in designing more robust and sustainable banking strategies in emerging markets.

3. RESEARCH METHODOLOGY

This study relies on secondary data derived from the financial and sustainability reports of banks registered with the Financial Services Authority (OJK) in Indonesia. The data span from 2020 to 2023 and were sourced from credible platforms such as the Indonesia Stock Exchange (IDX) website and each bank's official publications. The collection process was conducted online, focusing on publicly available financial disclosures and sustainability documentation.

A quantitative approach was adopted, emphasizing statistical analysis to test relationships between

variables in an objective and measurable manner, aligned with a positivist paradigm (Paramita et al., 2021). The research design is explanatory with a causal approach, aiming to assess cause and effect relationships among variables.

The study involves one dependent variable financial distress, measured using the Altman Z-score model for non manufacturing sectors. The independent variable is sustainability, proxied by green loans, while risk management serves as the intervening variable, represented by the Capital Adequacy Ratio (CAR). The research population includes all banks registered with the OJK during the period 2020–2023. A purposive sampling method was employed to select 33 banks that consistently published complete financial and sustainability reports, resulting in 132 observations (33 banks over 4 years).

Data collection used a documentation technique, supported by a literature review to reinforce the conceptual and theoretical framework. Data processing was first carried out using Microsoft Excel 2010 for organization, tabulation, and descriptive statistics. The main analysis was conducted using Structural Equation Modeling (SEM) via AMOS version 21, to accommodate the presence of a mediating variable.

The SEM analysis involved several stages: designing a path diagram, checking factor loadings (preferably >0.7), building structural models, and evaluating model fit using various indices (Chi-Square, GFI, AGFI, CFI, TLI/NNFI, RMSEA, RMR). Model validity and reliability were assessed through Average Variance Extracted (AVE > 0.5) and Composite Reliability (CR > 0.7). Model refinement was based on Modification Indices (MI ≥ 3.85), ensuring that no core model structure was altered (Ghozali, 2017).

The hypotheses tested in this study are as follows:

H1: Sustainability (green loans) significantly affects financial distress, as sustainable lending improves the financial stability and reputation of banks.

H2: Sustainability significantly affects risk management, as green financing can reduce reputational and operational risks.

H3: Risk management significantly influences financial distress, as stronger capital adequacy can help banks avoid financial difficulties.

H4: Risk management mediates the relationship between sustainability and financial distress, acting as a conduit through which sustainability influences bank vulnerability.

4. RESULTS AND DISCUSSIONS

a. Research Results

1) Overview of Research Objects

This study examined a sample of 33 banks annually, drawn from a total population of 103 banks listed with the Financial Services Authority (OJK) during the 2020–2023 period. The research centered on three core variables: financial distress, sustainability, and risk management.

a) Financial Distress

Financial distress was assessed using the Altman Z-Score for non manufacturing firms. The results show varying risk levels over the four year period. In 2020, the average Z-Score was at its lowest (2.565), reflecting the initial economic shock from the pandemic. The score improved in 2021 (3.179), suggesting early signs of recovery. However, it slightly declined again in 2022 (3.004) and dropped further in 2023 (2.556), indicating a resurgence in financial pressure on banks.

b) Sustainability

Sustainability was measured using the ratio of green loans to total outstanding loans (ROGL). A

consistent upward trend was observed, with the ROGL rising from 9.00% in 2020 to 21.34% in 2023. This indicates a growing commitment among banks to support environmentally responsible lending and integrate sustainability principles into their financing strategies.

c) Risk Management

Risk management was evaluated through the Capital Adequacy Ratio (CAR), which represents a bank's ability to absorb potential losses. A higher CAR reflects stronger risk bearing capacity and greater financial resilience. The analysis of CAR over the study period was used to assess how effectively Indonesian banks managed capital in response to various financial challenges.

2) Data Collection Results

a) Financial Distress

The analysis of financial distress levels for 33 banks from 2020 to 2023 reveals considerable variation in financial resilience across the banking sector. Using the Altman Z-Score as an indicator, many banks were categorized in the distress zone ($Z < 1.81$) during 2020, the height of the COVID-19 pandemic. A noticeable recovery began in 2021, although it was uneven across institutions, and continued through 2022. By 2023, 30 out of 33 banks had achieved Z-scores indicating financial soundness ($Z > 2.99$), while one bank remained in the grey area and two others were still at risk. The most extreme results were seen in PT Bank Raya Indonesia Tbk, which achieved the highest Z-score in 2021 (22.033), and PT Bank Panin Dubai Syariah Tbk, which had the lowest score in 2023 (-107.633). These results demonstrate that although the industry has largely recovered, some banks still exhibit significant vulnerability, underscoring the need for enhanced financial performance and risk mitigation efforts.

b) Sustainability

Sustainability performance, evaluated through the proportion of green loans to total loans (ROGL), showed varied progress among banks during the 2020–2023 period. In 2020, ten banks reported green loan ratios below 5%, reflecting limited commitment to sustainable lending. This number gradually decreased to nine in 2021 and eight in 2022, suggesting growing awareness and integration of sustainable finance. However, the figure rose again to ten banks in 2023, indicating uneven implementation. PT Bank Raya Indonesia Tbk exhibited the most substantial growth, increasing its green loan ratio from 6.86 in 2020 to 41.95 in 2023, signaling a strong dedication to environmental financing. In contrast, PT Bank Tabungan Negara (Persero) Tbk consistently reported the lowest ratios, with a modest rise from 0.0045 in 2021 to 0.0271 in 2023. These disparities reflect a combination of internal policy orientation, strategic priorities, ESG adoption levels, and external influences such as regulatory support and market demand. Overall, the trend suggests that while some banks are advancing rapidly in sustainability integration, others are still navigating the transition.

c) Risk Management

Risk management performance was gauged using the Capital Adequacy Ratio (CAR), which reflects a bank's capacity to endure financial shocks and maintain operational soundness. During the study period (2020–2023), the majority of banks maintained CAR levels above the regulatory minimum of 8%, signaling strong capitalization. Several banks, such as PT Bank Jago Tbk, PT Bank Amar Indonesia, and PT Allo Bank Indonesia Tbk, posted exceptionally high CARs, indicating large capital reserves that may not yet be fully deployed for lending. In contrast, institutions like PT BPD Jawa Barat dan Banten Tbk consistently recorded CARs below 1%, and PT Bank Mayapada International Tbk showed a declining trend. Major commercial banks—BRI, Mandiri, BNI, and BCA—demonstrated stable and high CAR levels above 20%, reflecting disciplined capital management and prudent risk practices. These findings point to significant variability in capitalization across banks and highlight the ongoing importance of monitoring CAR as a safeguard against potential financial instability.

3) Data Analysis Results

a) Descriptive Statistics

Descriptive statistics are used to provide an initial summary of the data characteristics utilized in this study. The research covers a sample of 33 banks over a four year period from 2020 to 2023, resulting in 132 total data points. The primary variables examined include Green Loans (GL), Capital Adequacy Ratio (CAR), and Financial Distress (FD). Table 1 summarizes the descriptive findings, followed by a narrative explanation for each variable to illustrate their distribution and central tendencies throughout the observation period.

Table 1. Descriptive Statistics Results

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
GL	132	.00	48.39	14.3181	11.56041
CAR	132	.17	169.92	31.3161	22.79529
FD	132	-107.63	22.03	2.8257	10.24005
Valid N (listwise)	132				

Source: Processed using SPSS, compiled in 2025.

Descriptive statistics in this study provide an initial overview of the data characteristics from 33 banks over the period 2020 to 2023, totaling 132 observations. The variables analyzed include Green Loans (GL), Capital Adequacy Ratio (CAR), and Financial Distress (FD).

Green Loans showed an average disbursement of 14.32 with a standard deviation of 11.56 and values ranging from 0.00 to 48.39, reflecting disparities among banks in implementing sustainable financing, where some banks have yet to disburse any green loans.

Meanwhile, the average CAR stood at 31.32% with a standard deviation of 22.80, ranging from 0.17% to 169.92%. This suggests a relatively strong capital structure, despite a wide gap between banks with very low and very high CAR values. For the Financial Distress variable, the average was 2.83 with a standard deviation of 10.24 and values ranging from -107.63 to 22.03. The very low minimum value indicates that some banks are under extreme financial pressure, while the positive maximum reflects financial stability in others. The large variation across these variables highlights the importance of further analysis on the impact of green loans on financial distress, considering the role of risk management in mitigating financial pressures.

b) Model Identification Assessment

- **Model Fit Test (Goodness of Fit Test)**

This stage is intended to evaluate how well the developed model fits the data by using several goodness of fit indicators. The assessment consists of two parts: (1) analyzing the model fit based on statistical outcomes, and (2) checking the fulfillment of fundamental assumptions in Structural Equation Modeling (SEM). The model tested in this study focuses on the role of Risk Management in mediating the effect of Sustainability on Banking Financial Distress. The complete results are provided in Table 2.

Table 2. Model Fit Test (Goodness of Fit Test)

Criteria	Value *Cut Off*	Results of the Test	Description
Chi Square (CMIN)	Less than the table value (df = 0,715, p > 0,05)	0,715, p = 0,133	Good
RMSEA	≤ 0,08	0	Good
GFI	≥ 0,90	0,999	Good
AGFI	≥ 0,90	0,995	Good
CMIN/DF	≤ 2 atau 3	0,715 / 1 = 0,715	Good
TLI	≥ 0,90	1,09	Good
CFI	≥ 0,90	1	Good
RMR	≤ 0,05	0,022	Good

Source: Processed Results using AMOS, analyzed in 2025

To determine how well the proposed model aligns with the data, a Goodness of Fit test was carried out. The model in question highlights the role of risk management in influencing the relationship between sustainability and financial distress in the banking sector. This evaluation includes two components: a statistical assessment of model fit and verification of the fundamental assumptions required in Structural Equation Modeling (SEM).

All fit indicators Chi Square (p = 0.133), RMSEA (0), GFI (0.999), AGFI (0.995), CMIN/DF (0.715), TLI (1.09), CFI (1), and RMR (0.022) fall within the acceptable thresholds. Based on the criteria outlined by Hair et al. (2019), a model is considered to have good fit if the majority of these values meet the standard benchmarks. Consequently, this model is deemed valid and appropriate for further analysis.

- **Evaluation of SEM Model Assumptions**

This stage involved testing assumptions in Structural Equation Modeling (SEM), particularly multivariate normality. Since the data did not meet normality assumptions, the bootstrap method (Efron, 1979; 1982) was applied to produce more reliable parameter estimates. After removing outliers using Mahalanobis Distance, 122 out of 132 observations were retained for analysis. The bootstrap analysis used 500 resamples with the Maximum Likelihood (ML) estimation and a 90% bias corrected confidence interval, including the Bollen-Stine Bootstrap test.

The Bollen-Stine p-value of 0.693 indicates that the sample data and model estimates are not significantly different, meaning the model remains valid despite the non normal data. The bootstrap discrepancy ranged from 0.000 to 12.943, with a mean of 0.939 and a standard error of 0.064, suggesting stable estimates. Overall, the model is statistically acceptable and suitable for further analysis of variable relationships.

c) Model Evaluation

- **Analysis of Direct Causal Effects**

Table 3. Analysis of Direct Causal Effects

Effect	*Estimate*	S.E.	C.R.	ρ	Description
GL → CAR	0,147	0,049	3,025	0,002	Significant
GL → FD	0,079	0,049	1,625	0,104	Not significant
CAR → FD	0,169	0,088	1,929	0,054	Not significant

Source: Processed using AMOS, compiled in 2025

In this stage, the model examined the relationships between sustainability (green loans) and risk management (CAR) on financial distress (FD). The direct effect of green loans on financial distress was not significant (estimate = 0.079, p = 0.104), which could be due to the relatively small proportion of green financing or its long term impact.

Green loans had a significant effect on CAR (estimate = 0.147, p = 0.002), suggesting that green financing influences the bank's capital structure, possibly due to the stability and lower risk associated with such loans. Meanwhile, the effect of CAR on financial distress was not significant (estimate = 0.169, p = 0.054), although the p-value was close to the significance threshold. This implies that capital adequacy has not yet become a dominant factor in directly explaining financial distress.

- **Examination of Indirect Effects Through a Mediating Variable**

Tabel 4. Results of Indirect Effect Testing

Indirect Effects	*Estimate*	p-value	Description
Green loans → FD through CAR	0,025	0,025	Significant

Source: Processed using AMOS, compiled in 2025

The analysis of indirect relationships through the mediating variable, Capital Adequacy Ratio (CAR), indicates that green loans have a statistically significant indirect effect on financial distress (estimate = 0.025, p = 0.025). This suggests that CAR serves as a relevant mediating factor in the link between green financing and financial distress, reflecting the role of capital strength in translating sustainability into financial stability.

These results reinforce the importance of effective risk management mechanisms. While certain direct effects may not reach statistical significance, the mediated pathway through CAR reveals critical insights into how sustainable financing initiatives can contribute to reducing financial vulnerability in the banking sector.

b. Discussion

1) The Influence of Sustainability on Financial Distress

This research concludes that sustainability, as indicated by the proportion of green loans, does not significantly affect financial distress among Indonesian banks during the 2020–2023 period. As a result, the hypothesis stating a meaningful relationship between green loans and financial distress is not supported by the data.

Several factors may explain this outcome:

a. The proportion of green loans in total bank credit remains relatively small, thereby limiting their influence on the overall financial condition of banks.
b. Green loans are typically long term and strategic in nature, whereas financial distress often arises from short term challenges, such as liquidity shortages or difficulty in fulfilling financial obligations.
c. Key determinants of financial distress generally involve financial ratios such as profitability, liquidity, and asset quality rather than sustainability metrics.
d. The development of green financing in Indonesia is still in its early phase, with inconsistent adoption and implementation across banking institutions.

While green loans may contribute positively to a bank's reputation and long term resilience, they have not yet become an effective instrument in preventing or addressing short term financial instability. Consistent with these findings, previous studies by Ecole (2020) and Sibarani & Lusmeida (2021) also reported that sustainability initiatives do not always show a significant effect on financial distress. Conversely, international studies, including those by Ali et al. (2023) and Citterio & King (2023), suggest that ESG related factors can lower financial risk and improve predictive models for financial distress.

These variations in findings underscore the context dependent nature of sustainability's impact on financial stability. Industry characteristics, regulatory environments, and institutional risk management approaches all play critical roles. Therefore, there is a need to more deeply embed sustainability into risk management practices in order to optimize its potential benefits for the Indonesian banking sector.

2) The Influence of Sustainability on Risk Management

This research reveals that sustainability, as reflected in the proportion of green loans, has a significant and positive impact on risk management, represented by the Capital Adequacy Ratio (CAR). Green loans are typically directed toward environmentally responsible projects that carry relatively low credit risk and often benefit from regulatory backing and government support, reducing the probability of loan defaults. Furthermore, this type of financing helps mitigate reputational and operational risks, thereby fostering public trust and promoting financial stability.

By incorporating green loans into their portfolios, banks are able to diversify credit exposure, which contributes to a stronger capital base and increased resilience. Through a more integrated risk management approach, green lending is shown to reinforce capital adequacy. Consequently, the hypothesis suggesting a positive effect of sustainability on risk management is supported.

These outcomes are consistent with earlier research. Dafermos & Nikolaidi (2021) argue that green lending can bolster capital strength when accompanied by supportive macroprudential measures. Similarly, Mirovic et al. (2023) note that green loans enhance the interplay between liquidity and profitability. Nevertheless, other studies such as those by Ahmad Febriyanto et al. (2023) and Sutrisno & Furqan (2023) found that the impact of green financing on financial performance is not always significant, often shaped more by external regulatory and market conditions than internal bank policies.

In Indonesia, regulatory developments continue to evolve, as demonstrated by the issuance of the Climate Risk Management and Scenario Analysis (CRMS) guidelines by the Financial Services Authority (OJK) in March 2024. Leading institutions such as PT Bank Negara Indonesia reported green loan disbursements of IDR 71.27 trillion as of June 2024, along with Sustainability Linked Loans totaling IDR 5.9 trillion. Similarly, PT Bank DBS Indonesia provided IDR 6.1 trillion in transition financing for initiatives like renewable energy and green infrastructure, while also enhancing ESG related risk governance and talent development.

On a global scale, financial institutions are increasingly embedding sustainability principles to prepare for climate related and energy transition risks. According to the Basel Committee and Reuters (2025), sustainability has emerged as a critical long term strategy to ensure operational resilience and business continuity.

To summarize, the link between sustainability and risk management within Indonesia's banking industry

remains highly contextual dependent on institutional characteristics, strategic orientation, and the extent of regulatory support. While green finance holds promise for enhancing long term stability and profitability, its implementation is still challenged by both internal dynamics and external pressures.

3) Risk Management Influences Financial Distress

This research indicates that risk management, as measured by the Capital Adequacy Ratio (CAR), does not have a statistically significant impact on financial distress within banks. This suggests that even with a high CAR, a bank is not necessarily protected from experiencing financial difficulties. This outcome can be explained by the preventive nature of CAR, which reflects regulatory capital requirements rather than the bank's immediate financial health. Moreover, other factors such as asset quality, managerial effectiveness, and the composition of the credit portfolio play a more critical role in determining financial distress. Additionally, CAR does not account for external influences like economic downturns or regulatory shifts that can directly affect a bank's financial stability.

These findings align with the conclusions of Aminah et al. (2019) and Suardika et al. (2023), who noted that a high CAR alone does not guarantee protection against bankruptcy risks. They highlighted the importance of considering other elements such as asset management and credit risk control in evaluating bank stability.

In contrast, these results differ from those reported by Kareem et al. (2022), who found a significant effect of CAR on financial distress. This discrepancy may be due to variations in economic conditions, bank organizational structures, or differences in study periods. For example, during the COVID-19 pandemic, even well capitalized banks faced financial distress owing to external shocks.

Lestari & Wahyudin (2021) observed that the effectiveness of the board of directors has a significant negative correlation with financial distress, indicating that stronger governance reduces the likelihood of financial trouble. However, the roles of the board of commissioners and audit committee were found to be insignificant. Profitability was identified as a moderating factor that enhances the board of directors' influence on the bank's financial health. Furthermore, Ragil et al. (2024) emphasized that successful risk management positively affects a bank's reputation, exemplified by the case of Bank Central Asia Syariah, where a good reputation helped mitigate financial distress risks.

Despite the average CAR among Indonesian banks reaching 25.9% in 2023 (Kontan, 2023), financial pressures remain due to factors like rising global interest rates, declining consumer purchasing power, and international economic uncertainties. This underscores that a strong capital base alone is insufficient without a comprehensive risk management framework. Overall, this study highlights the necessity for banks to adopt a holistic approach to risk management one that extends beyond capital adequacy to include asset quality, internal governance, operational efficiency, and the ability to respond to external challenges.

4) Sustainability Influences Financial Distress Through Risk Management

This research demonstrates that sustainability exerts a positive and significant influence on financial distress via risk management, with statistical evidence supporting this relationship. In the banking context, sustainability extends beyond environmental and social commitments to become a strategic element for ensuring long term financial resilience.

Sustainability is commonly measured by indicators such as green loans, which represent the share of bank financing directed toward environmentally sustainable sectors. Banks embracing sustainability principles are more likely to adopt rigorous credit evaluation processes and account for long term risks, fostering more proactive and adaptive risk management frameworks.

These institutions perform thorough risk assessments that consider environmental impacts, business viability, and compliance with ESG standards. Such effective risk management enables banks to better

identify and mitigate credit, operational, and reputational risks, reducing non performing loans and capital strain.

Conversely, banks that overlook sustainability often prioritize short term financial gains, resulting in weaker risk management practices and a higher propensity for accumulating problematic assets and experiencing financial distress.

Financial distress often quantified using models like the Altman Z-Score reflects severe financial challenges. Empirical findings indicate that banks with robust sustainability practices and sound risk management tend to sustain stable financial conditions, whereas those lacking these factors face greater vulnerability to distress.

The effect of sustainability on financial distress is mediated by the quality of risk management. Consistent integration of sustainability strengthens risk management capabilities, enabling banks to better anticipate uncertainties and maintain financial stability. This conclusion is both theoretically grounded and empirically validated through statistical analysis.

In summary, sustainability serves as a long term strategic approach that enhances risk management effectiveness and promotes financial stability, thereby mitigating the risk of financial distress.

Supporting literature includes Liu & Huang (2022), who found that sustainable financing reinforces risk management in state owned banks, and Neagu et al. (2024), who reported that green financing can lower credit risk. Additionally, Sutrisno & Furqan (2023) observed a positive impact of green loans on profitability, though not consistently mediated by specific risk management factors. However, studies by Hatmadi & Trihadmini (2022) and Ahmad Febriyanto et al. (2023) suggest that the effects of green financing on credit risk and financial outcomes in Islamic banks are not yet significant, indicating these impacts may be indirect or require more time to emerge.

The adoption of sustainability principles has been shown to strengthen risk management and decrease the likelihood of financial distress, as evidenced by major Indonesian banks and supported by regulatory and international institution initiatives. Consequently, integrating sustainability, risk management, and financial stability is essential for maintaining the resilience of Indonesia's banking industry.

5. CONCLUSION

This study reveals that sustainability, represented by the proportion of green loans, does not have a direct significant impact on financial distress within Indonesian banks during 2020–2023, largely due to the low share of green financing and its long term nature. However, sustainability positively influences risk management, measured by the Capital Adequacy Ratio (CAR), which in turn plays an important role in mitigating financial distress indirectly. The results also indicate that CAR alone is insufficient to prevent financial distress without a comprehensive and integrated risk management framework. Sustainability's indirect effect highlights the necessity of embedding sustainable principles within risk management policies to enhance the banking sector's resilience.

Practical implications emphasize the need for proactive credit risk supervision, early warning systems, and the incorporation of sustainability into risk management strategies, including staff training. CAR should be optimized not just for regulatory compliance but as part of a holistic risk evaluation process, supported by technology and independent risk units. Strengthening the alignment between sustainability initiatives and risk management, such as integrating environmental risk into credit assessments, is critical. Strong governance and managerial commitment, including the establishment of sustainability and risk committees, are vital. Regulators like OJK and Bank Indonesia play a key role in providing supportive policies and incentives.

Theoretical implications reinforce the role of risk management as a mechanism to reduce conflicts of interest within banking agencies, highlighting the importance of integrating sustainability to prevent financial distress.

Empirical findings show a positive relationship between green loans and CAR, suggesting that sustainable financing contributes to enhancing banks' capital strength and overall financial stability, thus reducing financial distress risk.

Recommendations include:

a. Future research should consider macroeconomic and systemic risk factors to develop more robust risk management models.
b. Banks are encouraged to promote sustainability policies and green financing while strengthening their capital adequacy.
c. Regulators should provide incentives and ensure thorough evaluation of sustainability practices alongside capital and risk metrics.
d. Investors and stakeholders should assess banks based on a comprehensive set of criteria including sustainability commitment.
e. Further studies should explore additional factors like operational efficiency, liquidity, and the role of macroprudential policies, especially during financial crises.

In summary, this study highlights the critical role of integrating sustainability principles into risk management frameworks to support financial stability and reduce the likelihood of financial distress in Indonesia's banking sector.

LIMITATION AND STUDY FORWARD

This study has several limitations that should be acknowledged. First, the focus on green loans as the sole proxy for sustainability may not fully capture the broader dimensions of sustainable finance and environmental, social, and governance (ESG) practices within banks. Additionally, the study period from 2020 to 2023 includes extraordinary economic conditions due to the COVID-19 pandemic, which may influence the generalizability of the findings to more stable periods. The research also primarily relies on quantitative indicators like the Capital Adequacy Ratio (CAR) to represent risk management, potentially overlooking qualitative aspects such as governance quality and internal risk culture. Furthermore, external factors such as macroeconomic conditions, regulatory changes, and systemic risks were not extensively modeled, which may affect financial distress outcomes.

For future research, expanding the scope to include a wider range of sustainability indicators beyond green loans, such as social and governance metrics, would provide a more comprehensive understanding of sustainability's impact. Incorporating macroeconomic variables and systemic risk factors could enhance risk management models, making them more robust under varying economic scenarios. Qualitative studies on governance practices and risk culture in banks may also complement quantitative findings. Additionally, longitudinal studies extending beyond crisis periods could help assess the stability of these relationships over time. Finally, exploring the role of emerging technologies and independent risk units in integrating sustainability into risk management may offer valuable insights for both academia and practitioners.

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