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Green Banking Disclosures and Financial Performance of Indonesian Listed Banks: A Comparative Study Across Bank Size Categories

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Abstract

Indonesian banking regulations divide commercial banks into BUKU 1, 2, 3, and 4 categories based on core capital, and through POJK 2017 regulate the obligation to implement sustainable finance and different deadlines for preparing Sustainability Reports (SR) for BUKU 3–4 and BUKU 1–2 banks. Further strengthening comes through SEOJK 2021, which regulates the form and content of annual reports and sustainability reports in more detail. Starting from this context, this study examines the extent of green banking disclosures (GBD) of Indonesian listed banks over the period 2019–2023. Specifically this study aims to : (1) examine the GBD trends of listed banks in Indonesia for the above period; (2) examine whether there are differences in GBD levels between BUKU 1, 2, 3, and 4 bank categories; (3) examine whether there are differences in GBD levels before and after the issuance of SEOJK 16/2021; and (4) testing whether there are differences in financial performance between BUKU 1, 2, 3, and 4 banks. GBD is measured using an index adapted from Bose (2018) through content analysis of annual reports and sustainability reports, while financial performance is proxied by ROA, CAR, NPL, and LDR. The results show that GBD exhibits a gradually increasing trend, with BUKU 4 banks consistently achieving the highest mean disclosure level each year. The extent of GBD improves significantly following the 2021 regulation, indicating a positive regulatory effect on disclosure practices. ANOVA tests confirm that GBD levels differ statistically across the four bank categories and follow a clear size-related pattern: BUKU 1 has the lowest disclosure, rising sequentially up to BUKU 4 as the highest. Similarly, significant differences are observed in ROA, CAR, NPL, and LDR across BUKU groups: BUKU 4 records the highest ROA and the lowest NPL, while BUKU 2 shows the highest CAR and LDR. Overall, the findings suggest that regulatory tightening and bank size jointly shape the landscape of GBD in Indonesian listed banks, reflecting the interaction between sustainability and prudential performance dimensions in the Indonesian banking landscape. This finding implies that regulation and resource capacity (bank size) jointly drive GBD levels. Therefore, the Financial Services Authority (OJK) needs to provide more targeted support and capacity building for small banks, while bank management needs to allocate adequate resources for green reporting systems to remain legitimate and competitive in the market.

Keywords: Green Banking, Sustainable Finance, Green Banking Disclosure, Sustainable Finance Disclosure, Financial Performance, Bank Size (BUKU)

1. Introduction

Climate change and environmental degradation have transformed the way financial institutions are expected to conduct their business. Banks, which were traditionally viewed as “non-polluting” sectors, are now recognized as pivotal intermediaries that can accelerate or hinder the transition to a low-carbon economy through their lending, investment, and risk management activities (Mir & Bhat, 2022; Park & Kim, 2020). In many jurisdictions, regulators and stakeholders increasingly demand that banks embed environmental, social, and governance (ESG) considerations into their strategies and disclose, in a transparent manner, how they manage climate and environment-related risks and opportunities (Manta et al., 2025). Green banking disclosure (GBD) has thus become a crucial aspect of company reporting, serving as both a communication instrument and a means of accountability and reducing information asymmetry (Gunawan et al., 2022).

As part of the country's commitment to the Paris Agreement to reduce carbon emissions and the Sustainable Development Goals, Indonesia has released a comprehensive sustainable finance framework (OJK, 2014). The cornerstone is the Financial Services Authority (Otoritas Jasa Keuangan/OJK) Regulation No. 51/POJK.03/2017 on the Implementation of Sustainable Finance for Financial Services Institutions, Issuers, and Public Companies. This regulation mandates financial institutions, including banks, to apply sustainable finance principles, submit a Sustainable Finance Action Plan (Rencana Aksi Keuangan Berkelanjutan/RAKB), and prepare a Sustainability Report either as an independent document or integrated within the annual report (OJK, 2017). In parallel with this overarching regulation, OJK issued Circular Letter No. 16/SEOJK.04/2021 on the Form and Content of Annual Reports of Issuers or Public Companies, which provides detailed guidance on the minimum content of annual reports, including sections on corporate governance and social and environmental responsibility, and aligns disclosure practices with the ASEAN Corporate Governance Scorecard (OJK, 2021a). Together, POJK 51/2017 and SEOJK 16/2021 strengthen the regulatory basis for sustainability-related disclosure in Indonesian listed banks.

Within this regulatory context, green banking disclosure can be defined as the extent to which banks report their policies, practices, products, and performance that contribute to environmental protection and sustainable development, including the management of environmental risks in lending, the provision of green products, internal eco-efficiency initiatives, and the governance mechanisms overseeing these activities (Firmansyah & Kartiko, 2024; Setyowati, 2023). GBD is expected to help stakeholders assess whether banks are effectively integrating sustainable finance principles into their operations, and to evaluate the credibility of their green commitments (Ahmar et al., 2024; Bukhari et al., 2020). At the same time, disclosure is not merely a neutral reflection of practice; it can also be used strategically to gain legitimacy, signal superior governance and risk management, or respond to coercive and normative pressures from regulators, investors, and civil society (Aslam & Jawaid, 2023; Bose et al., 2018). In emerging markets such as Indonesia, where information asymmetries and enforcement challenges remain significant, the quality and consistency of GBD become even more critical for influencing market perceptions and regulatory trust (Miah et al., 2021; Setyowati, 2023; Silalahi et al., 2023).

The structure of the Indonesian banking industry provides an additional institutional feature that is highly relevant to GBD. Historically, banks have been categorized into four “BUKU” (Kelompok Bank Umum berdasarkan Kegiatan Usaha) groups based on their core capital: BUKU 1 banks with core capital below IDR 1 trillion, BUKU 2 with IDR 1–<5 trillion, BUKU 3 with IDR 5–<30 trillion, and BUKU 4 with at least IDR 30 trillion and the broadest permissible business activities, including overseas operations (BI, 2012). More recently, OJK has transitioned to a new Core Capital Based Bank Group (Kelompok Bank berdasarkan Modal Inti/KBMI) classification, but the underlying logic remains similar: core capital serves as a proxy for bank size, operational scope, and capacity to absorb risks (OJK, 2021b). Larger banks (BUKU 3 and 4 or KBMI 3 and 4) usually have more resources, more complex governance structures, and a higher risk of reputational damage (OJK, 2024). This may mean that they have stronger incentives and abilities to provide extensive GBD than smaller banks. However, smaller banks may also face increasing regulatory pressure to comply, even when their internal systems and human resources are less developed. As an example, in the application of sustainability reporting, according to OJK (2017), for Bank BUKU 3 and BUKU 4, the obligation to implement sustainable finance and prepare an SR starts on 1 January 2019. Meanwhile, for Bank BUKU 1 and BUKU 2, the obligation to implement sustainable finance and prepare an SR comes later, starting on 1 January 2020.

A growing body of literature has begun to examine the determinants and consequences of green banking disclosure in both developed and emerging markets. Bose et al. (2018), focusing on Bangladeshi banks, found that regulatory guidance and corporate governance mechanisms positively influence GBD, and that disclosure practices tend to converge over time as green banking becomes routinized. In the context of the United States (US) bank, Hu and Borjigin, (2025) investigate whether the quality of climate risk disclosure influences banks' contributions to systemic risk. The study found that banks with higher-quality climate disclosures experience lower information asymmetry, reduced stock price volatility and downside market risk, and a smaller likelihood of transmitting systemic risk. In other words, more transparent and specific climate disclosures help strengthen overall financial stability and market resilience. In Indonesia, several studies have used the GBD index to investigate how corporate governance (Rahayu & Djuminah, 2022; Yulia et al., 2025), ownership structure (Kartiko & Firmansyah, 2024; Karyani & Obrien, 2020), and financial performance (Citraningtyas et al., 2024) relate to green banking disclosure in listed banks. These studies generally support the view that institutional pressures, board characteristics, and capital strength can shape the extent of GBD. In addition, a recent systematic review highlights that GBD has evolved into a growing research area since 2008, with increasing attention to measurement indices and institutional determinants, yet also notes that the evidence is fragmented across countries and time periods (Akomea-Frimpong et al., 2022).

Other studies observe a comparative analysis of bank disclosures. The analysis includes green banking practices and reporting and corporate social responsibility (CSR) disclosure comparisons between conventional and Islamic banks or between the two countries. Rahman et al. (2023) compare the green practices and reporting among banks in India and Bangladesh. The results reveal that compared to the Bangladesh Bank, Indian banks have expanded their green initiatives and invested more in green projects. Simsek et al. (2024) investigated the climate-related disclosure (CRD) differences between Islamic and conventional banks in a global context. The study finds that conventional banks share more information about climate change than Islamic banks, as Islamic banks are more focused on sharia compliance, which doesn't put much stress on protecting the environment. In other words, commercial banks may be more attentive to the needs of shareholders and stakeholders regarding climate and environmental issues. The effects were more pronounced with governance quality; conventional banks publish greater amounts of CRD information as governance quality improves, whereas Islamic banks disclose even less as their governance quality increases. In Indonesia, a study finds that Islamic banks provide more information about their CSR activities than conventional banks (Hamdani et al., 2020). The shortfalls in CSR disclosure for Sharia banks pertained to environmental and general information aspects, whereas conventional banks exhibited weaknesses in energy, employee health and safety, product, and community engagement. In terms of comparison, the review in the extant literature suggests that there is a lack of literature comparing GBD across different sizes of banks.

Gunawan et al. (2022) explore GBD in Indonesia over a nine-year period (2009-2017). The study concludes that the sustainability reporting of the Indonesian banking sector remains unsatisfactory. They have yet to comprehend the significance of serving as mediators and their indirect influence on individuals, the environment, and profit. The study expects that the GBD of Indonesian banks is anticipated to increase over time due to the implementation of POJK Number 51, which became effective in 2018. In line with Gunawan et al.'s findings, this study identifies some gaps. First, there is still limited evidence on how GBD has developed in Indonesian listed banks over the period when POJK 51/2017 was already in force and SEOJK 16/2021 was subsequently introduced. While POJK 51/2017 established the overarching sustainable finance framework (OJK, 2017), SEOJK 16/2021 tightened and clarified reporting expectations, particularly regarding the form and content of annual and sustainability reports (OJK, 2021a). It is therefore relevant to ask whether this regulatory refinement is associated with observable changes in the level of GBD. Second, as stated previously, relatively few studies explicitly compare GBD across bank size categories, even though differences in core capital, business complexity, and market visibility suggest that disclosure behavior may vary systematically from BUKU 1 to BUKU 4. Third, while financial performance indicators such as return on assets (ROA), capital adequacy ratio (CAR), non-performing loans (NPL), and loan-to-deposit ratio (LDR) are frequently used as explanatory or outcome variables in green banking studies, there is scant description of how these performance profiles differ across bank size groups in the context of the evolving sustainable finance regime in Indonesia.

Given the unique regulatory environment of the Indonesian banking industry discussed earlier, this study seeks to fill existing gaps by conducting a comparative analysis of green banking disclosure (GBD) and financial performance among Indonesian listed banks from 2019 to 2023. The research questions are presented as follows.

RQ 1: What is the level and trend of green banking disclosure among Indonesian listed banks during 2019–2023?

RQ2: Did the issuance of SEOJK 16/2021 impact the level of GBD, particularly in the comparison of the periods preceding and succeeding the regulation?

RQ3: Do banks of different sizes, as defined by the BUKU groups (1–4), have different levels of GBD?

RQ4: Are there any differences in financial performance, proxied by ROA, CAR, NPL, and LDR, across these bank size categories?

To answer these questions, the study uses an archival method, which means it looks at annual and sustainability reports to arrive at the GBD index score for each bank-year observation. Banks are categorized into BUKU 1, 2, 3, and 4 based on their core capital. Descriptive and inferential statistics, including ANOVA, are utilized to analyze variations in disclosure and performance among groups and periods. The study doesn't look at the statistical link between GBD and financial performance; instead, it focuses on describing and comparing the patterns of disclosure and performance across bank size categories and regulatory phases.

This research enhances existing literature in several ways. Theoretically, it expands institutional and legitimacy frameworks by demonstrating how a specific regulatory measure, SEOJK 16/2021, aligns with changes in disclosure practices within an emerging market banking system. Additionally, it presents multi-year studies of green banking reporting in Indonesian listed banks from 2019 to 2023, utilizing an index to illustrate both trends over time and differences across size categories. Practically, the research offers insightful information to regulators, bank management, and investors regarding the responses of various segments of the banking sector to sustainability reporting requirements. The study identifies areas that require additional guidance or capacity-building initiatives, especially for smaller institutions.

This study is grounded in three interrelated theoretical perspectives: legitimacy theory, institutional theory, and resource-based view (RBV) theory. Legitimacy theory asserts that companies strive to align their operations with societal values and expectations (Dowling & Pfeffer, 1975). Banks are more likely to expand their GBD when social norms about environmental responsibility and sustainability become stricter, as indicated by national regulations, for example, POJK 51/2017 and SEOJK 16/2021. The disclosure of sustainable finance makes a bank keep or regain legitimacy (Deegan, 2002). In this perspective, an increase in GBD over time and greater transparency post-2021 align with banks' efforts to establish and uphold legitimacy with regulators, the public, and international stakeholders.

Institutional theory, specifically the idea of coercive isomorphism, shows how formal rules and expectations from supervisory agencies affect how organizations act (DiMaggio & Powell, 1983). POJK 51/2017 and SEOJK 16/2021 are examples of coercive pressures that force banks to use sustainable finance practices and share important information in a specific format. From an institutional point of view, the rise in GBD after 2021 would suggest that the regulatory environment is good at getting people to change their behavior. On the other hand, the fact that there are still differences between BUKU categories would suggest that organizational resources and power affect how these pressures affect people.

From a RBV perspective, the disclosure of green banking can be regarded as a consequence of a bank's internal resource endowments. Companies with well-organized resources are more likely to be able to create advanced reporting systems and sustainable business practices (Barney, 1991; Wernerfelt, 1984). Hence, the theory suggests that larger banks (BUKU 4) possess superior slack resources, financial, technological, and human capital, which enable them to implement sophisticated green reporting systems that smaller banks (BUKU 1) cannot afford.

Previous studies indicate that following the issuance of regulations on CSR disclosure guidelines, the extent of CSR disclosures by listed companies in Indonesia increased (Ika et al., 2017), and a similar trend was observed in Malaysia (Esa & Ghazali, 2012). Additionally, Bose et al. (2018) present a foundational empirical study showing

that regulatory guidance and corporate governance characteristics significantly influence the level of GBD in Bangladeshi banks, with disclosure practices becoming more homogeneous over time. Based on the regulatory timeline, we argue that the technical clarity provided by SEOJK 2021 reduces information asymmetry and encourages higher compliance. Therefore, this study hypothesizes that there will be an increasing trend in GBD from 2019 to 2023 (H1) and that there will be a significant difference in GBD levels before (2019-2020) and after (2022-2023) the implementation of SEOJK 2021 (H2).

Drawing from RBV, larger banks have better access to resources and face greater scrutiny from international investors. Hence, this study posits that there is a significant difference in GBD levels among bank categories (BUKU 1, 2, 3, and 4), where larger banks exhibit higher disclosure (H3), and there are significant differences in financial performance (ROA, CAR, NPL, LDR) among bank categories (BUKU 1, 2, 3, and 4) (H4).

2. Method

2.1 Sampling and Data

The population includes conventional commercial banks listed on the Indonesia Stock Exchange (IDX). Through purposive sampling, the final sample is made up of banks that published consecutive annual or sustainability reports from 2019 to 2023. As of December 31, 2023, a total of forty-seven commercial banks on the IDX had published sustainability reports. The samples were selected based on the availability of both annual and sustainability reports throughout the consecutive observation period from 2019 to 2023. Four banks were found to have incomplete annual and sustainability reports. As a result, the final sample consists of 43 banks, leading to a total of 215 bank observations.

The 43 banks are categorized into four groups based on the BUKU size classification, which is determined by equity capital. The capital thresholds are defined as follows: BUKU 1 banks have core capital below IDR 1 trillion; BUKU 2 banks have core capital ranging from IDR 1 trillion to less than IDR 5 trillion; BUKU 3 banks have core capital between IDR 5 trillion and less than IDR 30 trillion; and BUKU 4 banks have at least IDR 30 trillion, allowing for a broader range of permissible activities, including international operations. Although there has been a transition to the KBMI (Core Capital-Based Bank Group) classification in recent regulations, the mapping between the BUKU and KBMI classifications remains closely aligned: smaller BUKU banks correspond broadly to KBMI 1, while larger BUKU banks align with higher KBMI categories (OJK, 2021b). In total, there are four banks classified as BUKU 4, namely Bank Central Asia, Bank Negara Indonesia, Bank Rakyat Indonesia, and Bank Mandiri. Additionally, nineteen banks are classified as BUKU 1, nine banks fall into the BUKU 2 category, and eleven banks are classified as BUKU 3. A detailed list is provided in the appendix. Although the OJK transitioned to the KBMI classification in 2021, the BUKU classification has been retained for the sake of longitudinal consistency.

2.2 Measurement of Green banking Disclosures

Consistent with previous research (Citraningtyas et al., 2024; Kartiko & Firmansyah, 2024; Khan et al., 2021) GBD is measured using an index. The disclosure index is constructed by synthesizing the framework of Bose et al. (2018). The index consists of 23 items across four dimensions: (1) Green Policy & Strategy, (2) Green Lending & Investment (including Green Bond/Sukuk), (3) Green Operations, and (4) Green Awareness/CSR. The scoring is dichotomous (1 if disclosed, 0 otherwise). The formula is:

$$GBD_a = \frac{\sum \text{item that revealed}}{21} \times 100 \quad (1)$$

2.3 Bank Financial Performance

This study utilizes four financial ratios as proxies for bank financial viability. The ratios are ROA, CAR, LDR, and NPL. Return on Assets (ROA) is a ratio that indicates how efficiently a bank generates profits from all assets

under its management. It is generally calculated by dividing profit (before or after tax, depending on the definition used) by total assets. For banks, ROA is an important indicator of management health and performance, as it reflects the bank's ability to efficiently manage third-party funds, disburse loans, manage securities, and other productive assets. The higher the ROA, the better the bank's ability to generate profits from its assets, making the bank more efficient and more attractive to regulators, investors, and other stakeholders (Munteanu & Ilie, 2021).

The capital-to-risk-weighted-assets ratio (CAR) is a numerical measure of a bank's financial strength. The Capital Adequacy Ratio (CAR) is a measure of a bank's ability to cover its earning assets' risks, particularly those associated with loans (Gharaibeh, 2023). This number is used to measure the strength of capital (Ika et al., 2023). According to Raharjo et al. (2014), banks must set aside a percentage of their total earning assets as capital. According to the Indonesian Central Bank (2013) regulation, all commercial banks in Indonesia are required to maintain a minimum capitalization of 8% of their risk-weighted assets. Banking institutions frequently maintain capital ratios over what is legally required in order to improve their lending operations. It will be able to maintain larger capital ratios at almost no cost due to the interest rate differential between deposits and loans (Islam, 2014). In this analysis, the LDR is the key indicator of a bank's liquidity. According to Ika et al. (2023), determining the LDR involves dividing the total loan amount by the total deposit amount. Deposits into a conventional bank are defined as loans within this structure. This research suggests that a bank that has a low loan-to-deposit ratio (LDR) likely has more liquid assets than liabilities, which means it may have smaller profits and is thus more secure than a bank with a larger LDR. But an LDR shows that the bank's financial situation has worsened due to over-lending. That the bank could have to liquidate some loans at a loss to pay out depositors is another possible outcome. According to Islam (2014), a relatively high LDR number indicates that liquidity is tight.

The NPL is the number of loans that are not being paid back compared to the total number of loans. Some people call the banking industry a high-risk industry because of the way each bank does business. Banks usually function as middlemen, therefore their main concern is credit risk. The NPL ratio is a tool to measure credit risk. Thus, as NPL rises, the risk level for a bank also rises (Islam, 2014). Table 1 shows the measurement of variables that previously discussed.

2.4 Data Analysis

To test whether there is a change in GBD in pre and post SEOJK 16/2021 paired t test or Wilcoxon signed rank test is utilized depending upon the normality of the data. Meanwhile, ANOVA is employed to examine differences in disclosure and performance across groups and periods. Before we conduct the test of the differences, descriptive statistics are assessed to identify the pattern and trend of GBD and financial performance over the observation period.

Table 1: Proxies of Variables

No	Variable	Measurement	Source
1	Green Banking Disclosures (GBD)	$GBD_a = \frac{\sum \text{item that revealed}}{21}$	(Bose et al., 2018)
2	Return on Asset (ROA)	$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$	(Munteanu & Ilie, 2021)
2	Capital Adequacy Ratio (CAR)	$CAR = \frac{\text{Total Equity}}{\text{Assets weighted by risk}}$	(Islam, 2014) (Gharaibeh, 2023)
3	Loan to Deposit Ratio (LDR)	$LDR = \frac{\text{Total Loan}}{\text{Total Deposit}}$	(Amidjaya & Widagdo, 2020)
4	Non-Performing Loan (NPL)	$NPL = \frac{\text{The amount of non-performing loan}}{\text{Total loan given}}$	(Caby et al., 2020)

3. Results and Discussions

3.1 Descriptive Statistics

Table 2 displays the descriptive statistics of all variables categorized by BUKU bank size. As presented in the table, the average GBD of all samples is 63 percent; the smallest GBD level is 5 percent, while the highest is 100 percent. Surprisingly, those who achieve 100 percent are not only in BUKU Bank 4, the highest-sized and premium bank, but also in BUKU Bank 2, the smaller level of banks. BUKU bank 1 achieves the lowest GBD at 5 percent, while its average GBD is 51 percent. The GBD in BUKU banks 2, 3, and 4 is 67 percent, 70 percent, and 90 percent, respectively, on average. It appears that the higher the size classification of the bank, the higher the GBD. The minimum level of GBD in BUKU banks 2, 3, and 4 is 14 percent, 43 percent, and 67 percent, respectively. It also follows the order of the bank size. The maximum level of GBD in BUKU bank sizes 1 and 3 is similar, i.e., 90 percent, while the maximum level in BUKU bank sizes 2 and 4 is the same, 100 percent.

Table 2: Descriptive Statistics of All Variables Categorized by BUKU Bank size

Variables	BUKU Bank categorization	N	Mean	Std. Dev.	Minimum	Maximum
GBD	1	95	0.51	0.22	0.05	0.90
	2	45	0.67	0.23	0.14	1.00
	3	55	0.70	0.14	0.43	0.90
	4	20	0.90	0.07	0.67	1.00
	Total	215	0.63	0.23	0.05	1.00
ROA	1	95	-0.29	2.78	-14.75	4.31
	2	45	0.87	5.05	-15.89	13.58
	3	55	1.70	0.83	0.09	4.22
	4	20	2.88	0.95	0.54	4.03
	Total	215	0.76	3.17	-15.89	13.58
CAR	1	95	35.83	21.46	9.01	127.42
	2	45	41.47	32.99	10.78	169.92
	3	55	24.33	4.84	17.31	38.70
	4	20	22.08	3.06	16.80	29.40
	Total	215	32.79	21.95	9.01	169.92
LDR	1	95	80.75	24.18	12.35	146.77
	2	45	95.07	32.77	40.94	163.19
	3	55	89.59	20.32	60.04	171.28
	4	20	80.79	8.95	61.96	96.37
	Total	215	86.01	24.99	12.35	171.28
NPL	1	95	1.88	1.40	0.00	4.96
	2	45	1.55	1.56	0.00	4.95
	3	55	1.11	0.73	0.20	3.15
	4	20	1.03	0.61	0.26	2.20
	Total	215	1.54	1.29	0.00	4.96

Source: Authors' compilation

In terms of ROA, the average profitability of the sample bank is relatively high at 0.76, while the minimum and maximum values of ROA are -15.89 and 13.58, respectively. This indicates that one bank has a loss 15.89 times higher than its assets, while another bank is profiting 13.58 times greater than its assets. Banks classified as BUKU size 2 recorded the lowest ROA, which is -15.89 percent. The average ROA values for BUKU bank sizes 1, 2, 3, and 4 are -0.29, 0.87, 1.70, and 2.88, respectively. This trend shows that profitability increases with the size of the banks' classification, indicating that larger banks tend to be more profitable.

The mean score for CAR is 32.79, with the lowest and highest scores being 9.01 and 169.92, respectively. The lowest score of CAR meets the minimum requirement of CAR set by the Indonesian Central Bank, which is 8.

The highest CAR is achieved by a bank in BUKU bank size 2, while the lowest CAR is obtained by a bank in BUKU bank size 1. The average CAR for BUKU banks 4 and 3 is 22.08 and 24.33, respectively, while the average CAR for BUKU banks 1 and 2 is 35.83 and 41.47, respectively. It appears that banks in BUKU bank sizes 1 and 2 have a higher CAR value than those in BUKU bank sizes 3 and 4; in other words, smaller banks have higher CAR.

The average value of LDR is 86.01, with the minimum and maximum numbers being 12.35 and 171.28, respectively. The highest average value of LDR is achieved by banks in BUKU bank size 2, i.e., 95.07, while the lowest average is achieved by banks in BUKU bank size 1, i.e. 80.75. The number is almost identical to the average LDR value of BUKU bank size 4, which stands at 80.79. The average LDR for banks in BUKU bank size 3 is 89.59. The highest LDR of banks in BUKU bank sizes 1, 2, and 3 is above 100, i.e., 146.77, 163.19, and 171.28, respectively. The data indicate that these banks are capable of extending credit beyond the total deposits they gather from the community.

In terms of NPL, the mean score is 1.54, with the minimum score of 0 and the maximum score of 4.96. The lowest and highest scores of NPL come from banks in BUKU bank size 1. The average score of NPL of BUKU bank size 1, 2, 3, 4 is 1.88; 1.55; 1.11; and 1.03 respectively. The number follows the order of bank size; the larger the bank, the smaller the NPL.

3.2 Trend of GBD

Table 3 displays the mean GBD scores for each year from 2019 to 2023, organized by BUKU bank size. This table illustrates the trend of GBD throughout the observation period for all samples and banks categorized by BUKU. Additionally, Figure 1 depicts the GBD trends of banks from 2019 to 2023, also categorized by BUKU bank size.

Table 3: Mean of GBD based on BUKU bank categorization

Bank Categorization	N	2019	2020	2022	2022	2023
BUKU 1	19	0.42	0.47	0.48	0.56	0.63
BUKU 2	9	0.57	0.57	0.64	0.76	0.79
BUKU 3	11	0.62	0.64	0.71	0.76	0.77
BUKU 4	4	0.83	0.91	0.91	0.93	0.93
All sample	43	0.54	0.57	0.61	0.69	0.73

Source: Authors' data analysis

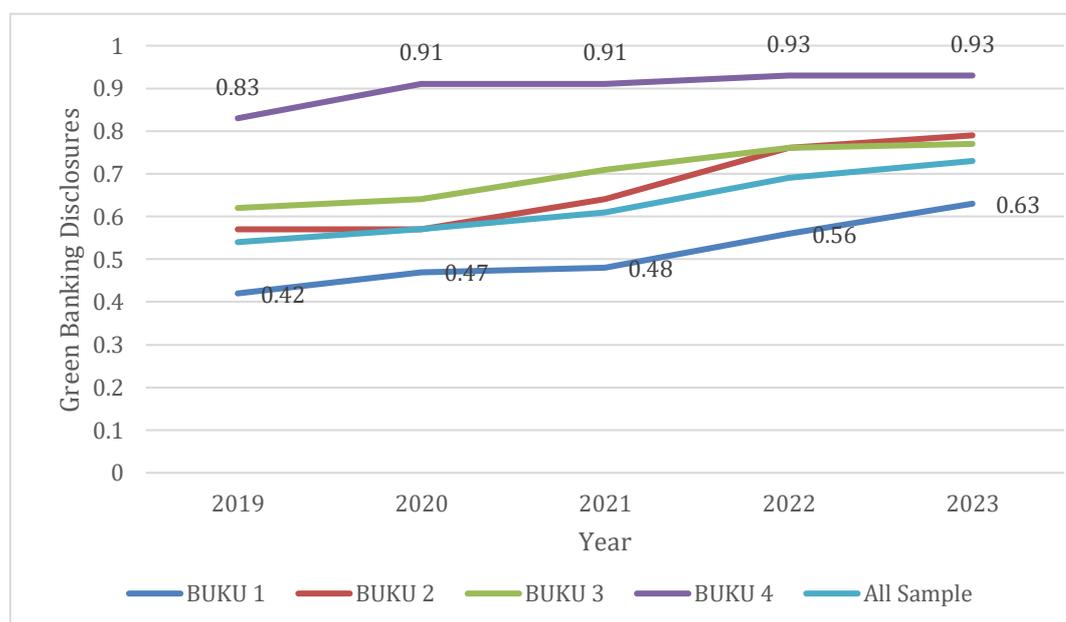


Figure 1: The GBD trends of banks from 2019 to 2023 categorized by BUKU bank size

As depicted in Figure 1 and Table 3, first, for the entire sample (43 banks), the average GBD rose steadily from 0.54 (2019) to 0.73 (2023). The number represents an increase of approximately 19 points (0.19) over five years, indicating that banks are truly responding to sustainable finance obligations and reporting format/content regulations by expanding their green disclosures.

Second, when broken down by the BUKU category, BUKU bank size 1 (19 banks) started from the lowest level of 0.42 (2019), then rose slowly but consistently to 0.63 (2023). This indicates that, despite relatively limited capacity and resources, small banks are still responding to regulatory pressure and the convergence of reporting practices. BUKU bank size 2 (9 banks) started at 0.57 (2019) and ended at 0.79 (2023). This sharp increase, especially after 2021, indicates that mid-sized banks have greater resource space to meet the disclosure standards expected by regulators and the market.

BUKU bank size 3 (11 banks) outperformed BUKU bank size 2 in almost all years, from 0.62 (2019) to 0.77 (2023). The trend is upward but tends to level off towards the end of the period (0.76 to 0.77), which can be interpreted as approaching a relatively high and stable pattern of disclosure levels. BUKU bank size 4 (4 banks) consistently has the highest GBD, from 0.83 (2019) to 0.93 (2023), with the largest increase from 0.83 to 0.91, and then it is relatively stable in the range of 0.91–0.93. This illustrates that the largest banks have been very intensive in disclosing green issues from the outset and have only made marginal improvements over time.

Third, the trend shows that the GBD levels conform to the order $BUKU\ 1 < BUKU\ 2 < BUKU\ 3 < BUKU\ 4$ for each observation year. During the time, this difference between groups stays the same, but overall, all of them get better, which leads to a gradual move toward higher disclosure standards. The average increase is most noticeable at the "All sample" level (from 0.61 to 0.69 then increase to 0.73) after the 2021 regulation on the form and content of reports. The pattern is also similar for BUKU 1 and 2, which supports the idea that stricter reporting rules motivate banks, especially smaller ones, to accelerate the improvement of their GBDs.

The early start requirement for BUKU 3 and 4 banks was consistent with what happened in 2019. According to POJK 51/2017, BUKU 3 and 4 banks must start using sustainable finance and write a Sustainability Report for the time period of January 1 to December 31, 2019. Therefore, it's not surprising that their GBD levels were already higher than those of other groups in 2019 (BUKU 3 = 0.62; BUKU 4 = 0.83). At the same time, BUKU 1 and 2 banks only had to make an SR for the time period that began on January 1, 2020. So, the 2019 GBD level for BUKU 1 (0.42) and BUKU 2 (0.57) can be considered a "pre-full obligation" phase.

Entering 2020 and beyond, the rise, especially in BUKU 1 and 2, seems to be in line with the start of the SR obligation for these two groups. BUKU 1 went up from 0.42 in 2019 to 0.47 in 2020 and then kept going up to 0.63 in 2023. BUKU 2 stayed in same GBD level from 0.57 in 2019 to 0.57 in 2020 and then went up quickly to 0.79 in 2023. This means that when the SR deadline started to apply to BUKU 1–2, banks in this group started to meet the requirements for the structure and substance of green disclosures set by POJK 51/2017 (and later clarified by SEOJK 16/2021). At the same time, BUKU 3 and 4, which had an earlier start, were moving toward a GBD level that was already nearly full in the high or very high level of disclosure. This was due to their established status in the green reporting system, which began with the SR obligation in 2019.

3.3 The Impact of SEOJK 16/2021 on GBD

Table 4 shows the paired t-test (or Wilcoxon signed-rank test) to see if there is a difference in the level of GBD after SEOJK 16/2021 was issued. The regulation outlined the rules for how public corporations should write and format their sustainability reports. For banks in BUKU bank size 1-3, we utilize the paired t-test to assess the mean difference; for BUKU bank size 4, we use the Wilcoxon signed-rank test, as the observed sample is only 4 banks.

Table 4: Results of Testing the Difference of GBD before and after SEOJK 2021

Bank Categorization	N	Mean pre regulation (mean rank)	Mean post regulation (mean rank)	t (Z)	Sig (2 tailed)
BUKU 1	19	0.44	0.59	-4.299	0.000***
BUKU 2	9	0.57	0.78	-2.416	0.042**
BUKU 3	11	0.63	0.77	-2.4171	0.036**
BUKU 4	4	(0.00)	(0.00)	(-1.826)	0.068*
All sample	43	0.56	0.71	-5.381	0.000***

*** is significant 1 percent, ** is significant at 5 percent, * is significant at 10 percent

Source: Authors' data analysis

The results of the pre-post difference test indicate that SEOJK 16/2021 is associated with a clear increase in Green Banking Disclosure (GBD) levels. For the entire sample (43 banks), the average GBD increased from 0.56 (pre-regulation) to 0.71 (post-regulation) with high significance ($p = 0.000$). Therefore, it can be concluded that the strengthening of regulations on the form and content of reports encouraged listed banks to expand their green disclosures.

When viewed by category, BUKU 1, BUKU 2, and BUKU 3 all showed statistically significant increases in GBD. BUKU 1 increased from 0.44 to 0.59 ($p = 0.000$), BUKU 2 from 0.57 to 0.78 ($p = 0.042$), and BUKU 3 from 0.63 to 0.77 ($p = 0.036$). For BUKU 4, the increase was only significant at the 10% level ($p = 0.068$), which is reasonable considering their initial GBD levels were already very high and the sample size was very small, thus limiting the scope for growth and statistical power.

Theoretically, this pattern aligns with institutional theory, which emphasizes that regulations act as coercive pressure that encourages organizations to adjust their practices. The issuance of SEOJK 16/2021, which clarified the format and content of reports, encouraged banks, especially those with lower levels of disclosure to improve their GBD to align with regulatory expectations and practices considered "good" in sustainable finance. This study's findings are also consistent with the findings of Ika et al. (2017) and Esa & Ghazali (2012), who showed that the existence of regulations governing the specific content of disclosure contributes to increased disclosure levels, thus strengthening the argument that a strengthened regulatory framework is effective in encouraging convergence of reporting practices among listed Indonesian banks.

3.4 The Different Level of GBD Across Bank Size Categories

Table 5 displays the results of the ANOVA test to assess the research question of whether there are any differences in GBD across BUKU bank size categories.

Table 5: Results of Testing the Difference of GBD Across Bank Size Category

Bank Categorization	N	Mean	F	Sig (2 tailed)
BUKU 1	95	0.51	28.046	0.000***
BUKU 2	45	0.67		
BUKU 3	55	0.70		
BUKU 4	20	0.90		

*** is significant 1 percent

Source: Authors' data analysis

The ANOVA test results in Table 5 show that the level of Green Banking Disclosure (GBD) differs significantly across bank size categories. The F-value of 28.046 with $p = 0.000$ indicates that the average GBD of BUKU 1 (0.51), BUKU 2 (0.67), BUKU 3 (0.70), and BUKU 4 (0.90) is not the same, and the pattern forms a clear gradient: the higher the BUKU category, the higher the average GBD. Empirically, this conclusion confirms that bank size as reflected by the BUKU classification is closely related to the intensity of green banking disclosure.

However, these results should not be interpreted simply as if lower GBD in small banks automatically means worse sustainability performance. First, BUKU 1 and some BUKU 2 banks operate with different capital capacities, infrastructure, and reporting teams than BUKU 3 and 4 banks, so the “depth” and “breadth” of their reports are understandably different. Second, the GBD index used in this study is adapted from Bose (2018) and does not explicitly distinguish whether a disclosure item in Indonesia is mandatory or voluntary according to POJK 51/2017 and SEOJK 16/2021. This implies that a higher score signifies the extent of disclosure, but it doesn't directly indicate the level of compliance with minimum regulatory requirements.

From an institutional theory standpoint, these findings indicate that regulatory pressure compels banks to enhance green disclosure, although the response is influenced by resource capacity and business scale. Large banks (BUKU 3 and 4) are better able to internalize regulatory demands into a comprehensive reporting system, while smaller banks are still in the adjustment phase. Therefore, the results of Table 5 should be read as a map of variations in disclosure intensity, rather than a normative ranking of sustainability quality, and open up space for further research that differentiates between mandatory and voluntary items within the Indonesian regulatory framework.

3.5 The Different Levels of Financial Performance Across Bank Size Categories

Table 6 presents the results of the ANOVA test to assess the research question of whether there are any differences in financial performance across BUKU bank size categories. There are four financial ratios namely ROA, CAR, LDR, and NPL which act as a proxy for financial performance.

Table 6: Results of Testing the Difference of Financial Performance Across Bank Size Category

Variable	Bank Categorization	N	Mean	F	Sig (2 tailed)
ROA	BUKU 1	95	0.51	28.046	0.000***
	BUKU 2	45	0.67		
	BUKU 3	55	0.70		
	BUKU 4	20	0.90		
ROA	BUKU 1	95	-0.29	8.998	0.000***
	BUKU 2	45	0.87		
	BUKU 3	55	1.70		
	BUKU 4	20	2.88		
CAR	BUKU 1	95	35.83	7.970	0.000***
	BUKU 2	45	41.47		
	BUKU 3	55	24.33		
	BUKU 4	20	22.08		
LDR	BUKU 1	95	80.75	4.229	0.006***
	BUKU 2	45	95.07		
	BUKU 3	55	89.59		
	BUKU 4	20	80.79		
NPL	BUKU 1	95	1.88	5.689	0.001***
	BUKU 2	45	1.55		
	BUKU 3	55	1.11		
	BUKU 4	20	1.03		

*** is significant 1 percent

The ANOVA test results indicate that all financial performance indicators (ROA, CAR, LDR, and NPL) differ significantly across BUKU categories, with F-values ranging from 4.229 to 8.998 and a p-value < 0.01. This indicates that the structure of profitability, capitalization, credit distribution, and asset quality are different across the BUKU 1 to BUKU 4 categories. Therefore, the GBD analysis needs to be read in conjunction with the financial profile of each bank group.

In terms of profitability and asset quality, the average ROA shows a clear gradient: BUKU 1 -0.29; BUKU 2 0.87; BUKU 3 1.70; BUKU 4 2.88. This means that the higher the BUKU category, the higher the bank's ability to generate profit from its assets, with BUKU 1 even still experiencing a negative average ROA. This pattern is consistent with the decreasing NPL as the BUKU category increases. The combination of higher ROA and lower

NPLs in BUKU 3–4 indicates that large banks are not only more profitable but also have relatively better asset quality.

For capital and intermediation, CAR is actually highest in BUKU 1 and BUKU 2 (35.83 and 41.47), then lower in BUKU 3 and BUKU 4 (24.33 and 22.08), although all are still well above the regulatory minimum. This can be interpreted as an indication that small and medium-sized banks tend to hold more capital (more conservatively), while large banks optimize it more aggressively. The highest LDR is in BUKU 2 (95.07), followed by BUKU 3 (89.59), while BUKU 1 and BUKU 4 are relatively lower (80.75 and 80.79). This indicates that mid-sized banks (BUKU 2) are the most aggressive in disbursing credit to third-party funds, while small and very large banks are in a more moderate intermediation position.

Overall, these results confirm that differences in GBD levels across BUKU occur within the context of systematically different financial performance profiles. BUKU 3 and 4 banks have higher GBD, higher average ROA, and lower NPLs. On the other hand, BUKU 1–2 banks tend to have more capital but less consistent profitability and asset quality. These findings support the notion that banks' financial capacity and risk profiles affect their ability to invest in green reporting systems. This doesn't mean that smaller banks are worse, but rather indicates that they operate under a different combination of constraints and priorities.

4. Conclusion

This study aims to (1) describe the Green Banking Disclosure (GBD) trends of listed banks in Indonesia during the 2019–2023 period, (2) compare GBD levels across bank size categories (BUKU 1–4), (3) assess whether there are differences in GBD before and after the issuance of SEOJK 16/2021, and (4) compare financial performance (ROA, CAR, NPL, and LDR) across BUKU categories. The analysis indicates that GBD has increased gradually over the years, with BUKU 4 banks consistently having the highest disclosure levels, followed by BUKU 3, BUKU 2, and BUKU 1. GBD levels were found to be higher in the post-SEOJK 16/2021 period, indicating that more detailed regulations regarding the form and content of reports are associated with stronger green disclosure. Furthermore, financial performance also differs significantly across BUKU categories, with larger banks generally exhibiting higher profitability and slightly better asset quality.

These findings support the institutional perspective, stating that when the OJK not only mandated reporting (through POJK 51/2017) but also detailed the structure and content of reports (through SEOJK 16/2021), banks responded by increasing the intensity of GBD. For regulators, these results demonstrate that specific regulations regarding the specific content of disclosure are effective in encouraging more comprehensive reporting practices, although the gap between BUKU 1–2 and BUKU 3–4 remains apparent, signaling the need for capacity building and a more proportionate approach for small and medium-sized banks. For bank management, GBD is increasingly becoming a crucial element of transparency and legitimacy in the eyes of the market, making investment in sustainability governance, data systems, and reporting infrastructure an increasingly relevant strategy, especially for banks already and likely to continue to be subject to sustainability reporting obligations. It is also important to emphasize that lower GBD levels among smaller banks should be understood primarily as differences in reporting depth and capacity, not necessarily an indication of their inherently poorer sustainability performance.

This study uses the GBD index adapted from Bose (2018) without explicitly distinguishing between mandatory and voluntary disclosure items within the Indonesian regulatory framework. Therefore, this index reflects the breadth of disclosure rather than the level of strict legal compliance. Future research is recommended to develop an index that differentiates between mandatory and voluntary items, allowing for analysis of disclosure behavior beyond compliance. Furthermore, the analysis of financial performance in this study is descriptive in nature and does not test the causal relationship between GBD and performance; further research could use panel regression to explore this relationship in more depth. Finally, the focus of this study remains on the quantity of disclosure, rather than the quality, tone, or specificity of the narrative; future studies could utilize text analysis or qualitative approaches (e.g., interviews with regulators and sustainability officials) to understand how green issues are communicated and interpreted by stakeholders.

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Appendix

Table A1. List of Sample Banks Categorized by BUKU Bank size

No	Bank Size Category	Code	Name
	BUKU 4		
1		BBCA	Bank Central Asia Tbk.
2		BBNI	Bank Negara Indonesia (Persero) Tbk.
3		BBRI	Bank Rakyat Indonesia (Persero) Tbk.
4		BMRI	Bank Mandiri (Persero) Tbk.
	BUKU 3		
1		BBTN	Bank Tabungan Negara (Persero) Tbk.
2		BDMN	Bank Danamon Indonesia Tbk.
3		BJBR	Bank Pembangunan Daerah Jawa Barat Tbk.
4		BNGA	Bank CIMB Niaga Tbk
5		BNII	Bank Maybank Indonesia Tbk.
6		BNLI	Bank Permata Tbk.
7		BRIS	Bank Syariah Indonesia Tbk.
8		BTPN	Bank BTPN Tbk.
9		MEGA	Bank Mega Tbk.
10		NISP	Bank OCBC NISP Tbk.
11		PNBN	Bank Pan Indonesia Tbk.
	BUKU 2		
1		ARTO	Bank Jago Tbk.
2		BBHI	Allo Bank Indonesia Tbk.
3		BBKP	Bank Bukopin Tbk.
4		BJTM	Bank Pembangunan Daerah Jawa Timur Tbk.
5		BSIM	Bank Sinarmas Tbk.
6		BTPS	Bank BTPN Syariah Tbk.
7		MAYA	Bank Maypada Internasional Tbk.
8		MCOR	Bank China Construction Bank Indonesia Tbk.
9		SDRA	Bank Woori Saudara Indonesia Tbk.
	BUKU 1		
1		AGRO	Bank Raya Indonesia Tbk.
2		AGRS	Bank IBK Indonesia Tbk.
3		BABP	Bank MNC International Tbk.
4		BACA	Bank Capital Indonesia Tbk.
5		BBMD	Bank Mestika Dharma Tbk.
6		BBYB	Bank Neo Commerce Tbk.
7		BCIC	Bank Jtrust Indonesia Tbk.
8		BEKS	Bank Pembangunan Daerah Banten Tbk.
9		BGTG	Bank Ganesha Tbk.
10		BINA	Bank Ina Perdana Tbk.
11		BKSW	Bank QNB Indonesia Tbk.
12		BMAS	Bank Maspion Indonesia Tbk.
13		BNBA	Bank Bumi Artha Tbk.
14		BSWD	Bank of India Indonesia Tbk.
15		BVIC	Bank Victoria International Tbk.
16		DNAR	Bank Oke Indonesia Tbk.
17		INPC	Bank Artha Graha Internasional Tbk.
18		NOBU	Bank Nationalnobi Tbk.
19		PNBS	Bank Panin Dubai Syariah Tbk.