



INVESTIGATING THE EFFECT OF GREEN BONDS ON FIRM'S ENVIRONMENTAL PERFORMANCE AND SHAREHOLDER'S WEALTH

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Despite its significant growth, the effect of corporate green bonds on environmental and financial performance in Indonesia is still under-researched. This paper is designed to answer the questions of whether environmental awareness drives companies to raise capital for green projects and, more importantly, whether issuing green bonds is effective to improving the companies' environmental and financial performance. Using desk reviews from public documents, this study examines green bonds issued by ten Indonesian companies during 2018–2023. It is found that all green bond issuers have climate targets and measures to reduce sustainability risks and that the fund proceeds are associated with climate change adaptation. However, it is unclear in which green bonds can really serve as a bridge between companies' environmental motives to improve environmental performance. Although the link is uncertain, the study further finds financial improvements with regards to the cost of debt, return on equity, and stock return.

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INTRODUCTION

In the capital market, green bonds and other thematic bonds (including social, sustainability, and sustainability-linked bonds) are among the fastest growing financial innovations. According to data from the Climate Bonds Initiative (CBI), the global outstanding green, social, and sustainability bonds combined have reached USD 4,3tn by end of 2023 from only USD 51,1bn in 2015. More than two-thirds of those bonds are labeled 'green' to finance such projects as renewable energy, eco-friendly buildings, clean transportation, water and waste management, sustainable land use, and other climate adaptation projects. The European market, followed by China and the USA, is by far the largest source of green bond issuance (Climate Bonds Initiative, 2024). Historically, the first green bond was issued in November 2008 as a collaboration between Swedish pension funds and the World Bank. Later in 2014, that bond laid the basis for the green bond principles (GBP) endorsed by the International Capital Market Association, ICMA (World Bank,

2019). GBP are voluntary guidelines for issuers on the transparency, disclosure, and reporting of the green bond. They have been adopted by many, if not all, countries to develop their green bond regulations.

Green bonds are fixed income securities that represent loans issued by sovereignties or private companies. The issuers repay the principles upon bond maturity and interest (coupon) over the bond tenure. Unlike conventional bonds, the distinctive feature of green bonds is in the use of proceeds, i.e., to finance or refinance green projects or assets (Tuhkanen & Vulturius, 2022). In order to verify that the revenues are going toward projects that benefit the environment, the issuers must obtain an external review (Flammer, 2021).

On the other hand, it is challenging to determine if green bonds actually support green projects. Even the GBP does not oblige issuers to comply with the set of principles; hence, there are no legal consequences for issuers who violate (Yeow & Ng, 2021). This lack of public

governance of corporate green bonds causes the problem of greenwashing (Flammer, 2021). Greenwashing is a practice of presenting false information about how companies are environmentally friendly. It involves making an unproven claim to deceive stakeholders into believing that it operates sustainably. With regards to green bonds, these companies issue them as marketing tool for the sake of good publicity (Yeow & Ng, 2021). Shi et al. (2023) further indicates that heavy polluting companies tend to create an image of being environmentally conscious by raising funds through green bonds without actually making substantial improvements to their green practices. In other words, with the lack of transparency and standardized metrics in the green bond or sustainability reporting, it will be difficult to independently verify whether, upon the green bond issuance, companies improve their environmental performance. There are also cases where local green bond standards conflict with international ones. In China, for instance. The CBI reported that around USD 6.6bn Chinese green bonds in 2019 are defined as ineligible according to the CBI's green taxonomy. Typically, green bonds proceed were invested in 'clean coal' utilization projects, which were allowed under the National Development and Reform Commission regulation, NDRC (Climate Bonds Initiative, 2020). Only in 2021, NDRC and China Securities Regulatory Commission excluded the controversial categories such as clean coal and clean fuel, due to international pressure (Climate Bonds Initiative, 2023).

In addition to that, as the capital market is imperfect and full of asymmetric information, companies issuing green bonds can be seen as a signal by investors in a way that those companies have commitment to address climate issues more seriously (Yeow & Ng, 2021). Maltais and Nykvist (2020), Flammer (2021), and Zheng et al. (2023) also shared the same signaling theory upon green bond issuance. Previous literatures have hypothesized the potential impacts of the green bond that may eventually add value to society at large. First is the environmental impact. Assume companies that issue green bonds are trustworthy and are using the proceeds to finance green projects. Thus, it can be expected that their actions will likely improve firms' environmental performance, like reducing greenhouse gases (GHG) emissions, improving their ESG score, or increasing their renewable energy mix. Being said, green bonds may have the ability to positively impact firms' environmental performance. There are evidence that certified green bond issuers emit

GHG levels that are lower than conventional bond issuers' emissions (Yeow & Ng, 2021; Garcia, et al., 2023), have better environmental ratings (Flammer, 2021; Garcia, et al., 2023) and specifically improve ESG scores by 20 percent on average (Zheng, et al., 2023). If more and more companies are considering issuing green bonds to finance their green projects or innovations, then the level of GHG reduction on a national basis should also be progressing. However, Yeow and Ng (2021) believe that this environmental impact is less likely to happen until the size of the green financial market is significantly large, which can be accomplished by making green bonds more attractive to small companies.

Second is the financial impact. Investors tend to perceive green bond issuers of having less sustainability risks. Specifically, if green bond investors are willing to trade financial returns for a lower yield, this debt instrument can be a cheaper source of financing (Flammer, 2021). Furthermore, to mobilize green investment, governments and financial authorities in some countries may implement tax incentives or listing fee discounts for issuing green bonds. Consequently, the lower cost of finance and cost reduction translate into long-term efficiency that may improve a firm's profitability (Yeow & Ng, 2021) and eventually create wealth for shareholders. Additionally, in their empirical research, Tang and Zhang (2020), Wang et al. (2020), Flammer (2021), and Fan et al. (2023) documented market reactions where stock prices responded positively to the announcement of green bond issuance.

Despite the presence of green bond regulation since 2017 by the Indonesia's Financial Services Authority (OJK), the growth of green bonds in this country is not even close to the global green bond market growth rate. Data depicted from Asian Bonds Online shows that the size of Indonesia's corporate green bonds is just 9.6 percent of overall bond issuance (Table 1). Similarly, for the other ASEAN-5 countries, only the Philippines and Singapore have the size of green bonds of more than 10 percent compared to conventional bonds (Asian Development Bank, 2024).

With very few of Indonesia's green bond issuers within the last six years, it is challenging to statistically predict whether issuing green bonds correlates with firms' environmental commitment. More importantly, whether green bonds can really contribute to improving the company's environmental performance and add value to shareholders.

Table 1. Issuance of Green Bonds (GB) vs. Conventional Bonds (CB) in ASEAN-5 (USD millions)

	Indonesia		Malaysia		Philippines		Singapore		Thailand	
	GB	CB	GB	CB	GB	CB	GB	CB	GB	CB
2018	606	6,910	340	38,940	0	5,520	154	13,740	338	50,510
2019	500	9,320	1,231	50,830	2,518	7,240	443	13,590	866	59,440
2020	1,110	6,160	451	42,630	1,891	7,500	936	14,790	1,039	39,730
2021	800	7,240	2,417	40,280	871	4,190	6,296	21,320	1,854	48,180
2022	664	9,760	3,625	43,430	1,529	8,910	1,539	10,590	2,171	60,380
2023	860	8,070	3,000	35,140	456	3,710	1,777	5,820	1,061	61,750

This study focuses on examining the environmental motive of issuing green bonds and whether this motive directs companies' environmental improvement and generates better financial performance in Indonesia's market. Flammer (2021) describes three potential rationales behind the green bond issuance: (1) send a signal to investors about companies' sustainability commitment; (2) act of greenwashing to mislead the market; and (3) obtain a cheaper cost of financing. The author added that inadequate regulation on corporate green bonds may cause greenwashing concerns. However, when examining green bonds globally, Flammer (2021) further found that green bond issuers make significant improvements on their environmental performance, which is inconsistent with a greenwashing motive. Similarly, Xing et al. (2021) argue that greenwashing behavior is easily detected. Hence, with strong green bond regulation, companies with such an act may not be able to secure access to green financing.

Moreover, the Asian Development Bank (ADB), in its policy summary, views that Indonesia's effort to tackle climate change has been communicated by several regulations and policies, in particular the ones that mandate business sectors to have sustainability strategies and report them (Asian Development Bank, 2022). Compliance with green bond principles, obtaining an external reviewer, and green bond reporting are also mandatory according to the OJK regulation. Along with the green bond policy, OJK also releases Indonesia Green Taxonomy that regulates the criteria of activities in which can be funded by issuing green bonds. According to the green taxonomy, the mining companies can only issue green bonds after some pre-requisites by the regulators are met first (Otoritas Jasa Keuangan, 2022). The fact that companies are willing to undertake a series of complex procedures, not to mention costly, can be interpreted as an indication of their commitment to the environment (Flammer, 2021). Therefore, the intention of doing greenwashing in Indonesia can be eliminated.

This paper will analyze ten green bond issuers in Indonesia during 2018-2023 to find the

links between corporate's motives and the role of green bonds to improve environmental performance and create economic value. Specifically, this study will be formulated to answer the following questions: Do the issuing companies have climate targets and strategies to mitigate sustainability risks that motivate the issuance of green bonds? To what extent are green bonds effective in improving firms' environmental performance? Do the issuers reap financial benefits from issuing green bonds that indirectly create wealth for shareholders?

I observed past research on Indonesia's green bonds revolving around policy analysis, prospect/challenges/constraints of issuing green bonds, and investors' motivations for purchasing green bonds. Therefore, this will be one of the early in-depth studies that investigate both the motives and effects of green bonds on a corporate level. The result of this study is expected to give insights for business actors and academia on the green bond market dynamics in Indonesia and finally, for policymakers to improve the regulation. The second section of this paper will review the underlying theories concerning green bonds. Followed by data collection and methodology in Section 3. Section 4 will discuss the findings, and finally conclude in Section 5.

LITERATURE REVIEWS

Indonesia's Green Bond Regulation

The government of Indonesia has set ambitious targets to achieve sustainable development goals. Mandated by the Paris Agreement in 2015, the country sets its emission reduction targets, known as Nationally Determined Contributions (NDC). According to the United Nations Framework Convention on Climate Change (UNFCCC), Indonesia has submitted the Enhanced NDC-2030 to increase emission reduction by 31.89%, unconditionally and 43.2%, conditional on international assistance (see: <https://unfccc.int/>). In addition to that, it launched the Just Energy Transition Partnership (JETP) in 2022 to realize the vision toward an energy transition. The goal is to reach 34 percent of the renewable energy mix by 2030

and achieve NZE by 2060 or sooner (JETP Indonesia, 2022).

As part of the solutions, business sectors are expected to take part in the decarbonization efforts. In other words, the realization of those ambitious targets will require huge mobilization of capital. The OJK has renewed the green bond regulation number 18/2023 to include the social bond, sustainability bond, sustainability-linked bond, and those thematic bonds based on Islamic principles (*sukuk*) into the green bond's family (Otoritas Jasa Keuangan, 2023). The regulation adopts GBP with regards to the core components for alignment with the principles of green bonds, which are: (1) use of proceeds to finance green or social projects; (2) internal process for project evaluation and selection; (3) management of proceeds where issuers are suggested to use separate accounts and (4) periodic reporting on the realization and allocation of funds.

The regulation also imposes issuers to establish a green bond framework, including the issuers' sustainability strategy, and to obtain an external reviewer to assess through pre-issuance as well as post-issuance of green bonds. What makes OJK's green bond regulation different from other ASEAN peers is in the mandatory buy-back requirement or change the coupon rate, if the bond no longer serves the green principles (Asian Development Bank, 2022). Finally, to stimulate green bond market growth, in 2020 OJK and Indonesia's stock exchange discounted the fee to register green bonds by 25 to 50 percent from the normal registration fee.

Environmental and Financial Motives of Issuing Green Bonds

As suggested in the label, the green bond has successfully been a signaling tool for a company to send a message to stakeholders that it engages in sustainability commitment. Being perceived as an environmentally friendly company has become more important these days, especially when there are regulatory, international, and stakeholders' pressures. The signaling theory states that issuing green bonds will send signal to the financial market that the companies engage in sustainable business practices (Zheng, et al., 2023). Issuers of green bonds argue that the effort they already put into addressing sustainability risks makes issuing green bonds more sensible. It can thus help to navigate the sustainability work internally and similarly as a good tool to communicate this externally (Maltais & Nykvist, 2020). Environmental awareness is also a valid reason for many green bond issuers that deal with, for example, renewable energy, clean transportation, and waste management businesses, as they usually have climate targets in their strategic documents (Tuhkanen & Vulturius, 2022).

Climate targets in this context are particularly those that are science-based. Targets are considered science-based if they are in line with what the latest climate science deems necessary to meet the Paris Agreement goals, which are limiting global warming to 1.5°C above pre-industrial levels and reaching net-zero emissions by 2050 at the latest (Science Based Target Initiative, 2024). Corporate climate targets are voluntary and expressed as absolute goals, such as a reduction of GHG emissions in a certain year relative to a baseline year or achieving NZE by a specific year (Tuhkanen & Vulturius, 2022). Therefore, setting climate targets is crucial since it allows companies to monitor their progress in moving from the current baseline to achieve their objectives in a certain area.

Another apparent motive is financial. Previous studies have investigated the link between financial motivation and issuing green bonds, e.g., to raise capital from the financial market (Maltais & Nykvist, 2020; Azhgaliyeva, et al., 2020; Flammer, 2021; Zheng, et al., 2023); to diversify investor bases (Maltais & Nykvist, 2020; Yeow & Ng, 2021); to make use of government incentives in the form of tax breaks and subsidies (Li, et al., 2018; Yeow & Ng, 2021); and to lower the cost of debt (Tang & Zhang, 2020; Gianfrate & Peri, 2019; Maltais & Nykvist, 2020; Flammer, 2021; Zheng, et al., 2023). Specifically, from the Indonesian context, a survey by the ADB with regard to financial motives revealed that 97 percent of issuers agreed that the opportunity to attract new investors—probably from those of pro-environment—is more relevant than possibly the lower cost of capital (Asian Development Bank, 2022).

Impact of Green Bonds on Firm's Environmental and Financial Performance

Borrowing data from Flammer's (2021) research, more than 65 percent of 1189 green bonds issued globally between 2013 and 2018 are certified, meaning that the majority of issuers have undergone external verification to establish that the green bonds comply with the GBP. Thus, we can assume that those certified issuers have a green bond framework and climate target in place. Having a climate target is important to coordinate companies' sustainable work internally (Maltais & Nykvist, 2020). By issuing green bonds, companies have taken a step forward in realizing their climate targets. Being said, it becomes logical to expect them to achieve better environmental performance after the issuance. Environmental performance is defined as the company's ability to reduce CO₂ and other GHG emissions resulting from operations and throughout its supply chain and is commonly measured by GHG reduction (Yeow & Ng, 2021; Flammer, 2021; Tuhkanen & Vulturius, 2022; Garcia, et al., 2023) and ESG

score (Flammer, 2021; Zheng, et al., 2023; Garcia, et al., 2023; Chen, et al., 2023). GHG emissions are typically CO₂ gas emission within scope 1 (fuel combustion for company vehicles and energy consumed for production and industry processes, like boilers and generators) and scope 2 (electricity for offices). While Scope 3 emissions, represent companies' entire supply chain (emissions from financed projects and other purchased goods and services). On the other hand, ESG Score is a measurement of a company's performance corresponding to environmental, social, and governance factors. It describes how well a company manages those three issues that will likely influence their business sustainability. There are evidence that certified green bond issuers emit GHG levels that are lower than conventional bond issuers' emissions (Yeow & Ng, 2021; Garcia, et al., 2023), have better environmental or ESG ratings (Flammer, 2021; Garcia, et al., 2023; Zheng, et al., 2023).

As a new financing instrument with limited supply, green bonds have relatively high demand among (institutional) investors (Maltais & Nykvist, 2020). Additionally, with the perceived lower environmental risk and certified by green bond experts, green bonds are generally traded at a premium with a lower yield (Maltais & Nykvist, 2020). There are empirical studies stating that, compared to conventional bonds, the yields of green bonds are on average 2 to 34 basis points lower in various markets (Zerbib, 2019; Gianfrate & Peri, 2019; Wang, et al., 2020). Furthermore, when a firm announces its green bond issuance, there will be significant media exposure compared to conventional bond issuance. This will provide a good signal to the market, and more investor attention could drive a positive stock price. Wang et al. (2020), Tang and Zhang (2020), Flammer (2021), and Fan et al. (2023) employed an event study to calculate cumulative abnormal returns and found that investor's attention are statistically stronger on and post-issuance of green bonds.

Because of the characteristics of a higher credit rating and relatively low environmental risks, companies find it more convenient to issue green bonds with a lower coupon. This has been beneficial to reducing not only companies' cost of debt but also their cost of capital (Zhang, et al., 2021; Li & Duca, 2024). However, the argument of getting a lower cost of capital by issuing green bonds is debated by Flammer (2021) as she found no yield difference between green and conventional bonds. Additionally, Yeow and Ng (2021) found that green bond issuers do not significantly generate a higher return on assets post-issuance. It may need a longer period (three to five years) to measure the impact of green bonds on financial performance. Consequently, issuing green bonds does not always affect long-term efficiency that will improve a firm's profitability.

DATA AND METHODOLOGY

This study looks into green bonds issued by ten Indonesian companies for the period of 2018-2023 from different business sectors. They are banking (3), renewable energy (2), commercial finance (3), pulp and paper material (1), and food (1). Among the ten issuers, six of them are public companies that are listed on Indonesia's stock exchange.

To answer the research questions, this study primarily follows the methodology of Tuhkanen and Vulturius (2022) which is carried out by reviewing publicly available documents to collect information such as corporate's climate targets, sustainability strategies, green bond frameworks, and GHG emission. Public documents include the annual report and sustainability report, as well as documents related to green bond issuance (green bond frameworks, prospectus, reporting, and external review). Additionally, ESG performance uses scores created by the Sustainalytics rating agency.

To examine financial performance, I specifically measure three financial ratios: cost of debt (*COD*), return on equity (*ROE*), and cumulative abnormal return (*CAR*). *COD* is an after-tax cost of debt because it reflects the actual cost of borrowing for the company, taking into account the tax benefit associated with the interest expenses. To see whether the green bonds make a difference in the company's *COD*, I calculate the *COD* three years prior to the issuance date and compare it with the post-issuance until maturity date. For example, Sarana Multi Infrastruktur (SMI) that issued green bond in 2018, the three-year prior would be from 2015-2017, and since the bond mature in five years, I also calculated the *COD* until 2023. Most of the green bonds issued have 3-5 years of tenure; therefore, for companies that issue the green bonds on or after 2021, the last *COD* will be in 2023.

The *COD* is calculated using this formula:

$$COD = \text{interest} / \text{avg. debt} \times (1 - \text{tax rate}) \quad 1)$$

Debt is taken from the interest-bearing debts, i.e., deposits from customers (for banks), loans from banks, bonds issued, and other interest-bearing debts. Average debt would be the average of debt at the beginning of the period and the current period. The tax rate is the average of the tax paid divided by the taxable income.

Subsequently, I utilize companies' financial statements to find the *ROE* ratio, three years prior and after the issuance until maturity, depending on data availability. Unlike Tang and Zhang (2020) who uses return on assets (*ROA*) as a proxy of profitability ratio, I use *ROE* as it is more relevant to measure the shareholder's return.

Finally, to study market reactions around green bond issuance, I conducted an Event Study to estimate *CAR*, that is also done by Tang and Zhang (2020), Wang, et al. (2020), Flammer (2021), and Fan, et al. (2023). The Capital Asset Pricing Model (CAPM) is used to measure the expected return, following Tang and Zhang’s (2020) method. Stock prices are observed within 90 trading days around the green bond issuance. Only the stock prices of green bond issuers which are public companies, will be observed. The CAPM formula to estimate the expected return of a stock is:

$$E(R_i) = R_f + \beta_i (E(R_m) - R_f) \qquad 2)$$

The risk free (*R_f*) rate uses Indonesia’s treasury rate divided by 250-day trading at a particular time during green bond issuance, while the market return (*R_m*) uses the daily return of the Indonesia composite index. I estimate the beta of each firm (*β_i*) using statistical regression starting from 60 trading days to 15 trading days before the issuance date. The event study is applied within event windows from 10 days before and 10 days after the issuance and from 5 days before and 10 days after the issuance to check for robustness. Table 2 details the type of data to be collected, methodology, and sources of document for analysis.

Table 2. Data collection and methodology

Research questions	Data collected	Methodology
Do the issuing companies have climate targets and strategies to mitigate sustainability risks that motivate the issuance of green bonds?	- Climate targets - Sustainability strategies - Green Bond framework	Desk review on companies’ annual reports, sustainability reports, and green bond reports
To what extent are green bonds effective in improving firms’ environmental performance?	- GHG emission - ESG score obtained from Sustainalytics website	Desk review on companies’ annual reports, sustainability reports, green bond report
Do the issuers reap financial benefits from issuing green bonds that indirectly create wealth for shareholders?	- Cost of Debt (<i>COD</i>) - Return on Equity (<i>ROE</i>) - Cumulative Abnormal Return (<i>CAR</i>)	- Formula (1) and (2) to calculate <i>COD</i> and expected return. - Event Study on stock prices extracted from yahoo finance, around the green bond issuance.

RESULT AND DISCUSSION

Table 3 lists the ten issuers of green bonds for the period of 2018-2023 from different business sectors. Financial institutions and corporations have different schemes for the use of green bond proceeds. Corporate green bonds are used to finance issuers’ own projects, while financial institutions issue green bonds to make green loans. SMI, whose core business is to provide commercial and public financing for infrastructure development project, is the first company to issue an IDR-denominated green

bond in 2018. The green bond issuance per company ranges from IDR 500bn to IDR 11tn and from USD 150mn to USD 500mn. Credit rating obtained from Pefindo (an Indonesian rating agency), Fitch, and Standard & Poor with various grades from junk to investment grade. The average coupon rate is 7.45% for IDR-denominated and 3.6% for USD-denominated. Those of USD-denominated are listed on the Singapore Exchange (SGX). As we can see from table, the lower the credit rating, the higher the bond’s coupon.

Table 3. Corporate Green Bonds Issuers, 2018-2023

Issuers	Sector	Amount (millions)	Currency	Avg. Coupon	Bond Type	Credit Rating
Bank Mandiri (BMRI)	Banking	5,000,000	IDR	5.95%	Green	AAA
Bank Mandiri (BMRI)	Banking	300	USD	2.00%	Sustainability	BBB-

Sarana Multi Infrastruktur (SMI)	Financials	500,000	IDR	7.68%	Green	AAA
Arkora Hydro (ARKO)	Renewable Energy	339,895	IDR	9.75%	Green	A
OKI Pulp & Paper Mills (OKI)	Pulp and Paper	1,281,560	IDR	9.13%	Green	A+
Bank Rakyat Indonesia (BBRI)	Banking	11,000,000	IDR	5.78%	Green	AAA
Bank Rakyat Indonesia (BBRI)	Banking	500	USD	3.95%	Sustainability	BBB-
Bank Negara Indonesia (BBNI)	Banking	5,000,000	IDR	6.60%	Green	AAA
Sarana Multigriya Finansial (SMF)	Financials	700,000	IDR	6.90%	Social	AAA
Indonesia Infrastructure Finance (IIF)	Financials	335,190	IDR	8.25%	Green	AA
Indonesia Infrastructure Finance (IIF)	Financials	150	USD	1.50%	Sustainability	BBB
JAPFA Comfeed (JPFA)	Food	350	USD	5.38%	Sustainability-linked	BB-
Pertamina Geothermal Energy (PGEO)	Renewable Energy	500	USD	5.15%	Green	BBB-

Issuers’ Climate Targets, Sustainability Strategies, and Green Bond Framework

Table 4 summarizes the climate targets and sustainability strategies by each company, obtained from their Sustainability Reports. Of the ten issuers, six have own climate targets; three follow the government’s target (NZE by 2060 or sooner); and one does not have a specific climate target. OKI’s climate target, however, is an integral part of the APP group as its holding company. Additionally, BBRI is the only issuer to submit a commitment letter for approval from

Science Based Target Initiative (SBTi) and establishes its science-based climate targets through it. SBTi is a corporate climate action organization founded in 2014, that enables companies and financial institutions to play their part in combating the climate crisis. Despite considering itself a pure-play renewable energy company, ARKO, surprisingly, does not have its own climate target. All six companies that have their own climate targets, define their short-term (usually through 2030) and long-term targets (from 2050 and beyond).

Table 4. Climate Targets and Sustainability Strategies

Issuer	Climate targets	Sustainability strategies/ Initiatives
BMRI	- NZE from operational by 2030 - NZE from financing by 2060	- Mitigation strategies: reducing GHG emissions and providing financing to support the transition to NZE. - Develop Sustainability Framework 2024-2028 (Sustainable banking, Sustainable operations, and Sustainability beyond banking).
BBRI	- Reduce Scope 1 & 2 emissions by 42% by 2030 - NZE from operation by 2050	Establishing climate change strategies (developing climate risk strategy, managing carbon emission on own operations, and green banking as part of decarbonization strategy).
BBNI	- NZE from operational by 2028 - NZE from financing by 2060	- Short-term roadmap (through 2024): strengthen infrastructure and establish NZE and carbon budget - Medium (2025-2026): strengthen Risk Acceptance Criteria for lender, improve climate risks mitigation

		- Long-term (2027 and beyond): implement climate risk management in all aspects.
SMI	Support the government's program to achieve NZE by 2060	- Encourage sustainable infrastructure development (especially in financing renewable energy sector) - Implement safe and environmentally friendly operational activities.
IIF	Support the government's program to achieve NZE by 2060	Develop sustainable infrastructure financing strategies and practices in line with IIF's Social & Environment (S&E) principles.
SMF	No climate targets	Mitigate the negative impacts that may arise by implementing the principles of sustainable development in every project, by balancing the project's economic benefits with its S&E aspects.
OKI	- 30% reduction in carbon intensity from 2018 baseline - NZE by 2050	Establish the Sustainability Roadmap Vision 2030. The roadmap ensures meticulous execution across group's operation, that comprise sustainable products, carbon footprint reduction, conservation of natural resources, etc.
JPFA	- 25% Scope 1 GHG reduction by 2030 and 50% by 2040 - Zero coal by 2040 - NZE by 2050 (GHG Scope 1)	Developed Sustainability Strategy Plan 2019-2026 that focuses on improving efficient production system: healthy animals, use of resources, and minimize waste and emission.
ARKO	Support the government's program to achieve NZE by 2060	Designs multiple initiatives and programs to support the SDGs, such as providing employment opportunities, clean and affordable energy, decent work and economic growth, responsible consumption and production, handling climate change and partnerships for achieving goals.
PGEO	- Reduce the emissions intensity of scopes 1, 2, and 3 by 29 by 2030, from the 2020 baseline - Increase the Renewable Energy mix up to 96% by 2030 - NZE 2060	- Managing energy consumption by using renewable energy and efficiency of energy consumed. - Developing climate change actions and emission reduction efforts, by reducing environmental footprint, calculating the potential reduction of GHG emissions, and managing climate change risks and opportunities.

To achieve those climate goals, four companies have established a sustainability roadmap that primarily covers short-term climate risk mitigation strategies through 2030 (see: BMRI, BBNI, OKI, and JPFA). BMRI, for instance, adjusts its lending policy to the energy sector that uses coal in accordance with the government's energy transition plan, such as phasing out financing for the coal sector starting in 2040, as part of its sustainable banking framework. Although SMI, IIF, and SMF do not have their own climate targets, they have formulated strategies and integrated ESG aspects to mitigate the negative environmental impact that may arise from every project they finance.

Particularly, SMI will prioritize the health, education, renewable energy, and urban infrastructure sectors. It has also set a five-year plan (2019-2024) to reduce the amount of financing for coal-fired power projects by a maximum of 5 percent and increase the amount

of financing related to climate change mitigation by a minimum of 10 percent. Moreover, all companies mentioned in their Sustainability Reports that issuing green bonds has been part of the strategic initiatives in the sustainability strategy statement.

As mandated by the OJK regulation, all green bond issuers should formulate a green bond framework that outlines the use of proceed, project evaluation and selection, management of proceeds, and impact reporting. The issuers should also appoint an external verifier to certify that the green bond framework aligns with at least the OJK regulations, as well as ICMA's GBP, and ASEAN's GBS. Table 5 details the green bond allocation plan as specified in the green bond prospectus as well as external review certification. The findings further indicate that all issuers have established a sufficient green bond framework and that all external review certify the alignment of their framework with the ICMA GBP, ASEAN

GBS, and OJK regulations. The two uncertified issuances (BBRI sustainable bond and JPFA sustainability-linked bond) are listed at SGX,

where SGX’s listing rules for sustainability bonds do not mandate issuers to obtain external reviews or certifications.

Table 5. Green Bond Allocation and External Verification

Issuer	Allocation	External Review
BMRI Sustainability Bond	To finance eligible projects in accordance with specific prescribed eligibility criteria as described under the Bank’s sustainability framework	Yes, by Sustainalytics.
BMRI Green Bond	To finance activities included in the environmental business activities, with a portion of at least 70% used to finance green projects.	Yes, by SDG Hub Universitas Indonesia.
BBRI Sustainability Bond	To finance sustainable projects/ activities that have a positive environmental and/ or social impact.	No. Only limited assurance conducted by Sustainalytics.
BBRI Green Bond I	To refinance several projects that are already in BRI’s financing portfolio and have environmental and social benefits.	Yes, by SDG Hub Universitas Indonesia.
BBRI Green Bond II	To finance activities included in the category of environmentally aware business activities (at least 70%) and social activities (maximum 30%).	Yes, by SDG Hub Universitas Indonesia.
BBNI Green Bond	To finance activities included in the category of environmental business activities, with at least 70% used to finance green projects.	Yes, by Sustainalytics.
SMI Green Bond	To finance eligible green projects according to SMI’s green bond policies.	Yes, by CICERO.
IIF Sustainability Bond	To allocate proceeds within 2 years of the issuance. Unallocated proceeds will be held in cash, cash equivalents and/or marketable securities, in accordance with IIF’s cash management policies.	Yes, by Sustainalytics.
IIF Green Bond	To finance green projects, in particular sustainable infrastructure.	Yes, by SDGs Hub Universitas Indonesia.
SMF Social Bond	To finance eligible projects identified in social financing framework to provide affordable housing.	Yes, by DNV Thailand.
JPFA Sustainability-linked bond	To repay the existing US\$250 million notes. The rest of the funds will be used to construct water recycling facilities.	No. Only limited assurance conducted by Ernst & Young.
ARKO Green Bond	91% will be used to refinance loans. The remaining will be used as company’s working capital.	Yes, by SDG Hub Universitas Indonesia.
OKI Green Bond	To finance the biomass facility and waste management and to enhance operation as well as facility maintenance.	Yes, by DNV Singapore.
PGEO Green Bond	To use part of the proceeds for project-based lending and equity investments into its pure-play subsidiaries.	Yes, by Sustainalytics.

Subsequently, Table 6 breaks down the green bond proceeds allocation taken from the latest green bond reports. Almost all green bond proceeds have been used or disbursed by the end of 2023, unless IIF green bond and SMF social bond that were issued in December 2023.

Renewable energy and sustainable agriculture are the two most funded businesses from the green bonds issued by banks and commercial finance companies. The funded renewable energy projects are hydro, solar, and biomass power plants that have a positive environmental impact in terms of

renewable energy produced per year and GHG emissions avoided.

Another major disbursement is within the category of clean transportation and sustainable cities. One of the prominent projects funded by BBNI's green bond is the Light Rail Transit

project that connects the greater Jakarta area. This monorail transport system integrates with other transportation modes such as commuter lines, bus stations, and airport trains. With a total route of 43 km and serving at least 25 million passengers per year, this project is estimated to be able to avoid 55,414 tons CO₂eq/year.

Table 6. Reported Green Bond Allocation

Issuer	Outstanding	Use of Proceeds (Funds Allocation)								
		RE	WM	CT/SC	MF	GE	DWE	SLU	H	O
BMRI GB (USD 300mn)	Fully disbursed	109	6	128		18	39			
BMRI SB (IDR 5tn)	Fully disbursed	3,457						1,531		
BBRI SB (USD 500mn)	Fully disbursed			156	250		92		2	
BBRI GB I (IDR 5tn)	Fully disbursed	2,413			578		374	1,635		
BBRI GB II (IDR 6tn)	Fully disbursed	1,392			191		992	3,520		
BBNI GB (IDR 5tn)	IDR 637bn	343	569	2,653				798		
SMI GB (IDR 500bn)	Fully disbursed	182		318						
IIF SB (USD 150mn)	Fully disbursed	68	34	48						
IIF GB (IDR 335bn)	IDR 335bn									
SMF SB (IDR 700bn)	IDR 700bn									
JPFA SLB (USD 350mn)	Fully used		100							250
ARKO GB (IDR 340bn)	Fully used	340								
OKI GB (IDR 1.28tn)	Fully used			No allocation detail is provided						
PGEO GB (USD 500mn)	Fully used	400								

Category note: RE (Renewable energy); WM (Water & waste management); CT/SC (Clean transportation/ Sustainable cities); MF (Micro Financing); GE (Gender equality); DWE (Decent work & employment growth); SLU (Sustainable land use); H (Affordable housing); O (Others).

As the only company that issued a sustainability-linked type of bond (SLB), JPFA has a unique allocation of proceeds. Stated in the prospectus, the net proceeds will be used to repay the existing USD 250mn notes and for general corporate purposes, including but not limited to capital expenditure, working capital, and debt refinancing. The rest of the funds will be used to

construct water recycling facilities. The SLB prioritizes an environmental KPI that is linked to the achievement of a ‘Sustainability Performance Target’ to minimize the impact related to water pollution from untreated wastewater. The target is that, over the next 3-4 years from the date of the SLB issuance, the firm will construct eight water recycling facilities under its poultry operations

and one water recycling facility at a hatchery within the poultry breeding unit.

Finally, to answer the first research question of whether the issuing companies have climate targets and strategies that motivate the issuance of green bonds, it is notable that almost all green bond issuers have climate targets and strategies to mitigate sustainability risks and that the reported fund allocations are related to climate change mitigation. However, only a few issuers publish the post-issuance reporting, despite the mandatory requirement. For instance, OKI reported that all proceeds have been used, but no detail information is found on how much is allocated to finance the biomass facility and waste management and how much to enhance operation as well as facility maintenance. Another shortcoming is that there is an absence of a standardized approach to assess the impact of green bond financing. It is also observed that each reviewer has a different standard to certify the green bond frameworks.

Issuers’ GHG Emissions and ESG Score

The CO₂ emissions listed in Table 7 are typically within scope 1 and scope 2. Specifically, because of the nature of PGEO’s operation, the calculation of GHG emissions is expressed as total emissions in tons of CO₂ equivalent, which includes CO₂ gas and non-CO₂ GHG such as CH₄ and N₂O. Unless mentioned specifically, the NZE and GHG reduction targets are usually for Scope 1 and 2. There are various methods to measure carbon emissions. For example, ARKO, OKI, and SMF employ a standardized emission factors provided by IPCC-2006 to calculate Scope 1 emissions. For Scope 2, they multiply electricity consumption by the average grid emission factor issued by the Ministry of Energy and Mineral Resources. Additionally, SMI uses generally accepted GHG accounting standards, in particular ISO 14064-1.

Table 7. CO₂ Emissions and Reduction

Issuer	First GB Issued	Baseline Year	CO ₂ emissions, measured in Ton CO ₂ eq					Avg. Reduction from First GB Issued	Avg. Reduction from Baseline
			2019	2020	2021	2022	2023		
BMRI	2021	2019	358,754	315,279	314,257	302,780	295,713	▼ -3.00%	▼ -4.72%
BBRI	2019	2022		443,970	434,174	492,370	486,271	▲ 3.05%	▼ -1.24%
BBNI	2022	Unspecified	22,075	32,274	29,510	296,220	189,360	▼ -36.07%	NA
SMI*	2018	2019	1,561	911	1,080	1,438	1,911	▲ 5.19%	▲ 5.19%
IIF	2021	Unspecified			221	320	317	▲ 19.77%	NA
SMF	2023	2020	130,795	79,942	77,206	85,020	116,193	NA	▲ 13.13%
JPFA**	2021	2022			580	593	642	▲ 5.12%	▲ 8.26%
OKI	2023	2019	220,805	175,868	139,015	217,546	216,046	NA	▼ -0.54%
ARKO	2023	Unspecified			230	373	643	NA	NA
PGEO**	2023	2020	86,317	87,292	106,968	119,143	89,160	NA	▲ 0.70%

*Include Scope 3 emission. **Only Scope 1 emission.

All issuers have reported their emissions right after or even before they issued green bonds. BMRI is the only company that is able to reduce emissions from the period of the first green bond issuance as well as from the baseline year. BBRI and OKI start to record emission reductions from the baseline year, but not from the year of first issuance. However, there are some inconsistencies in the data presentation, especially from the two firms, BBNI and PGEO. BBNI changed its methodology in 2022, and the huge emission reduction in 2023 raises a question of whether the company’s decarbonization effort really succeeded or whether the bank reduced its operational activities, which is rather unlikely.

Additionally, the company does not specify the baseline year, despite its ambitious target to achieve NZE from operation by 2028. Meanwhile, PGEO has an NZE target for Scope 1, 2, and 3, from the 2020 baseline, but only started to measure Scope 3 in 2021. This inconsistency creates difficulties for analysts to track companies’ progress relative to their target. Besides, there are instances where the progress of CO₂ emissions does not align within the right decarbonization pathway, for two reasons:

When the company sets the baseline year of 2020 and the NZE target by 2030, it should as well reduce the average emission by 10 percent annually. Although in some cases, the reduction

can be non-linear because the company might invest in emission reduction technologies in the early years and make a significant reduction in later years. For emissions that cannot be eliminated, the company should invest in carbon offset projects that might involve reforestation, renewable energy projects, or carbon capture and storage, which either absorb CO₂ or prevent future emissions. This carbon offset activity should be certified and reported so that analysts can practice sufficient progress tracking. The said data is, unfortunately unavailable in the companies' sustainability reports.

Furthermore, Table 8 presents the ESG scores provided by Sustainalytics, accessed in July

2024 from Sustainalytics' website and companies' sustainability reports. All the big banks have been improving their ESG scores since the green bond issuance date, in particular BBRI that is progressing from medium-risk, in 2021-2022 to low-risk in 2023-2024. PGEO is also able to maintain its ESG risk at a negligible level after the issuance date. Unfortunately for ARKO and JPFA, green bond issuance does not necessarily reduce their ESG risks. Although ARKO claims itself as a renewable energy producer, the rating agency considers the effort in managing environmental issues is still lacking, where hydropower plants normally generate ecosystem disruption and deteriorate water quality.

Table 8. ESG Score

Issuer	First Issuance	ESG Score Interpretation	ESG Score				
			2020	2021	2022	2023	2024
BMRI	2021	20-30 (Medium risk)	29,74	29,71	29,28	29	28,4
BBRI	2019	10-20 (Low risk)		25,34	20,94	18,84	17,8
BBNI	2022	20-30 (Medium risk)	28,59	27,51	25,06	25,7	20,6
PGEO	2023	0-10 (Negligible risk)				8,4	9,3
ARKO	2023	40+ (Severe risk)					41,4
OKI	2023	20-30 (Medium risk)					23
JPFA	2021	30-40 (High risk)					39,8

Finally, to answer the second research question of whether green bonds are effective in improving firms' environmental performance, there is one company out of ten recorded emission reduction post green bond issuance and three from the baseline year. Furthermore, there are four out of seven companies improved their ESG score after the first green bond issuance. These findings indicate that there is hardly alignment between companies' climate targets and environmental performance. Therefore, issuing green bonds does not necessarily make the company reduce GHG emissions and improve its ESG score.

This study affirms previous research conducted by Tuhkanen and Vulturius (2022) who find it difficult to accurately attribute environmental performance to green bonds. The authors analyzed twenty European green bonds in 2018 and further added that issuing green bonds

does not always go hand in hand with setting ambitious climate targets and leading them to better environmental performance.

Issuers' Financial Performance

Cost of Debt and Return on Equity

From the ten companies in observation, only OKI does not disclose full information on the total debts, interest, and tax expenses. Therefore, I cannot measure the *COD* for the company. The year-0 for BMRI, BBRI, and IIF is the first issuance date, as they issued green bonds more than once during the period. Table 9 represents *COD* and *ROE* (in blue) from three years prior green bond issuance ($y_{-3,-1}$), on issuance (y_0), and post issuance until maturity (y_{1-5}). The NA remarks indicate that financial reports are unavailable by the time of this study.

Table 9. Cost of Debt and Return on Equity

Issuer	y_{-3}	y_{-2}	y_{-1}	y_0	y_1	y_2	y_3	y_4	y_5
BMRI	2.29%	2.54%	2.17%	1.55%	1.34%	1.79%	NA	NA	NA
	16.23%	15.08%	9.36%	16.24%	22.62%	27.31%	NA	NA	NA
BBRI	2.93%	2.77%	2.79%	2.94%	2.86%	1.86%	1.57%	2.33%	NA
	12.08%	20.03%	20.49%	19.41%	11.05%	16.87%	16.76%	18.25%	NA

BBNI	2.77%	2.29%	1.29%	1.33%	1.92%	NA	NA	NA	NA
	13.40%	2.60%	9.40%	14.90%	15.20%	NA	NA	NA	NA
SMI	2.63%	2.51%	3.57%	4.54%	5.31%	4.14%	3.13%	2.82%	3.97%
	6.40%	4.75%	4.06%	4.65%	4.85%	5.35%	4.94%	5.64%	5.17%
IIF	4.52%	4.63%	3.69%	3.59%	3.52%	4.21%	NA	NA	NA
	-2.00%	0.75%	2.01%	2.46%	3.66%	4.49%	NA	NA	NA
SMF	6.36%	5.52%	4.88%	4.69%	NA	NA	NA	NA	NA
	5.36%	3.60%	2.81%	2.79%	NA	NA	NA	NA	NA
OKI	12.50%	15.90%	21.80%	8.50%	NA	NA	NA	NA	NA
JPFA	9.03%	7.50%	7.49%	6.64%	5.27%	5.70%	NA	NA	NA
	19.40%	15.10%	10.70%	16.30%	10.90%	6.70%	NA	NA	NA
ARKO	7.45%	10.59%	11.79%	7.76%	NA	NA	NA	NA	NA
	-19.02%	29.08%	13.18%	8.93%	NA	NA	NA	NA	NA
PGEO	1.39%	0.98%	1.05%	1.94%	NA	NA	NA	NA	NA
	7.12%	6.92%	10.14%	8.30%	NA	NA	NA	NA	NA

All the banking companies have typically low *COD* compared to others. Their ability to attract low-cost deposits, represented by the CASA (current account saving account) ratio, is a significant help in reducing the cost of finance. BMRI, BBRI, and BBNI in this case have at least 70 percent of their total interest-bearing debt from customers’ deposits. The data shows that BMRI has a lower *COD* on first green bond issuance (2021) and maintains it a year after. However, as it issued the second green bond in 2023 (y_2), the *COD* is slightly increasing. Quite similarly, BBRI is able to lower the *COD* in three years after the first issuance (2019), but on the third issuance in 2023 (y_4), the *COD* goes up, presumably because the increase in debt collected between 2022 and 2023 is not followed by the growth of low-cost deposits. Looking at the *ROE* figures, all three banks are, on average, having higher profitability on the date of issuance compared to three years prior. However, only BMRI and BBNI are able to manage the higher return until 2023 after the issuing date. This result indicates that the lower *COD* as a result of green bond does not necessarily make BBRI sustain the higher return.

SMI and IIF have a similar business nature, where they provide financing for infrastructure development projects in Indonesia. Their source of debt is generally coming from bank loans and multilateral financial institutions. The amount of debt for SMI has significantly increased as its business grows. It can be seen from the *COD* that is increasing even when the company issued green bonds. The *COD* only starts to decline two years after green bond issuance, when the company received a loan from the government in 2020. While the portion of green bond for SMI is less than 2 percent, which makes it irrelevant to lower the *COD*, this government loan has contributed to significantly lower the *COD* due to the

implemented interest rate, i.e., 20-year government bond + 0.75% p.a. only. The effect of green bonds for IIF is similar to BMRI in that the company gets a lower *COD* on the issuance date, but a small increase occurs when the company issued the second green bond in y_2 . Furthermore, it seems that SMI and IIF also gain momentum from the green bond issuance, as it improves the *ROE* for SMI and IIF post-issuance.

Overall, I analyze that green bonds have the potential to reduce *COD*, in which six out of nine companies obtained lower *COD* on y_0 . However, this effect is only short-term in that only three companies maintain lower *COD* post-year issuance. With regard to *ROE*, green bonds have an effect on improving *ROE* for seven out of ten companies on y_0 , while only three companies are able to maintain the higher *ROE* in post-year issuance.

These results further indicate that: (1) to lower *COD*, firms should have a large portion of green bonds and the ability to obtain low-cost debt, and (2) the effect of green bonds on *COD* and *ROE* is rather short-term, whereas to sustain a low cost of debt and a higher return over a longer period will depend on the companies’ ability to grow and operate efficiently.

This study supports the findings of Zhang et al. (2021) and Li and Duca (2024) who stated that green bonds have been beneficial to reducing cost of debt, but contradict to Yeow and Ng (2021) who found that green bonds do not significantly generate higher profitability post-issuance.

Cumulative Abnormal Return

Table 10 summarizes the *CAR* of nine green bonds issued between 2018-2023 from six public issuers. The effect of green bond

announcements on stock price is specifically observed within ten days prior/post issuance date and five days prior/ten days after the issuance date. The market reacts positively, as reflected by

the stock price appreciation from the six green bond announcements. However, the reaction is not always the same for subsequent issuances.

Table 10. Cumulative Abnormal Return

Issuer (Issuance)	Cumulative Abnormal Return	
	[-10,10]	[-5,10]
BMRI (Sustainability Bond – 19 Apr 2021)	-0.92%	-4.05%
BMRI (Green Bond Phase I – 04 Jul 2023)	3.44%	2.46%
BBRI (Sustainability Bond – 28 Mar 2019)	12.24%	7.20%
BBRI (Green Bond Phase I – 20 Jul 2022)	0.62%	0.33%
BBRI (Green Bond Phase II – 17 Oct 2023)	-10.90%	-6.78%
BBNI (Green Bond Phase I – 21 Jun 2022)	-5.52%	-0.10%
JPFA (Sustainability-Linked Bond – 23 Mar 2021)	18.86%	8.01%
ARKO (Green Bond Phase I – 08 Aug 2023)	2.93%	8.84%
PGEO (Green Bond – 27 Apr 2023)	19.66%	14.69%

The typical stock return, as researched by Tang and Zhang (2020), Wang et al. (2020), Flammer (2021), and Fan et al. (2023), is that the market responds positively to the first green bond issuance(s) but not to the subsequent one. It can be illustrated by figure 1, where BBRI’s stock price appreciated upon the first and second green bond announcement – but not on the third announcement.

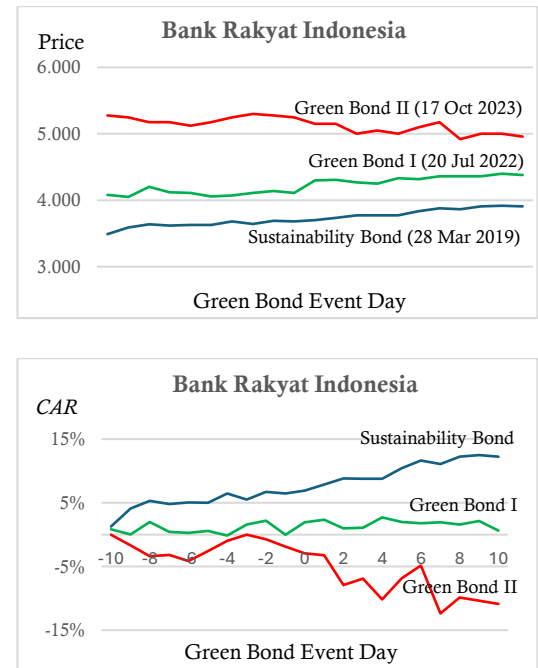


Figure 1. Stock Price and Cumulative Return for BBRI

As suggested by the signaling theory, the green bond issuance may serve as a positive signal to the market that the company is committing to address climate issues more seriously. At the same time, it attracts pro-environment investors who demand an investment instrument that will have

an impact on future generations. Additionally, green bonds are also perceived as having less sustainability and reputational risk; thus, the companies that raise funds through green bonds are expected to generate significant returns. This study further supports Wang et al. (2020), Tang and Zhang (2020), Flammer (2021), and Fan et al. (2023) who stated that stock market reactions are stronger on and after the announcement of the corporate’s green bonds.

The findings on the financial ratios subsequently answer the third research question on whether green bond issuers reap the financial benefits that indirectly create wealth for shareholders. It is manifested by the companies’ ability to generate a lower cost of debt and a higher return on equity after issuing green bonds, as well as a higher cumulative abnormal return upon green bond announcement.

CONCLUSION AND RECOMENDATION

To the best of my knowledge, this paper is among the first to provide an in-depth analysis of the Indonesia’s corporate green bonds from different aspects. *First*, despite its reputation for impact financing, the market size of green bond issuance in Indonesia is still far from ideal to boost environmental development. *Second*, it is notable that green bonds are more prevalent in companies that have quite significant economic scale (banking) and in industries in which environmental issues are material to the companies’ operations (energy). *Third*, the companies are willing to put efforts in developing a green bond framework and undertake a complicated and costly process to issue green bonds. The environmental motive behind issuing

green bonds is therefore justified. And *fourth*, although green bond issuers are mostly able to gain financial benefits from the reduced cost of debt and increased return on equity and cumulative average stock return, there is also a questionable link whether green bonds can really serve as a bridge between companies' environmental motives and obtaining environmental performance. The answer is rather uncertain, as there is an absence of standardized sustainability report that include environmental data.

This study calls for future research since the size of Indonesia's corporate green bond is expected to expand and more information will become available. Future research could provide a larger scale of evidence and the long-term implications of corporate green bonds with more rigorous statistical method. Last but not least, this study enlightens the current regime to improve public governance regulations, especially those related to standardized environmental data as well as data transparency. Indonesia has a long way to go toward the NZE goal. It will require a huge mobilization of capital; therefore, there is ample room for the growth of green bonds. As part of the emerging markets, Indonesia might develop its green taxonomy to include broader environmental projects such as carbon capture and storage (CCS) projects or ocean conservation-based activities (i.e., blue bonds). It could also build collaboration within ASEAN countries on harmonizing green bond regulation in order to increase environmental data transparency and standardization. There may be limited awareness and understanding of green bonds among investors as well as technical expertise among issuers; hence, institutional support for providing guidelines or increased training can lead to green bond development.

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