

THE ROLE OF GREEN BONDS AND SUSTAINABLE FINANCE IN ACCELERATING CIRCULAR ECONOMY TRANSITION

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Abstract

Green bonds and sustainable finance are increasingly recognized as strategic instruments in supporting the green development agenda and accelerating the transition to a circular economy. The circular economy, which relies on the principles of refuse, reuse, and recycle, demands fundamental changes in production and consumption models, and requires financing support that is not only economically sustainable, but also environmentally and socially friendly. The global climate crisis, environmental degradation, and uncontrolled exploitation of natural resources have driven the emergence of circular economy as an alternative paradigm of sustainable development. Circular economy emphasizes the principles of waste reduction, reuse, and recycling to extend the life cycle of materials and reduce pressure on the environment. However, the implementation of circular economy in Indonesia faces major challenges, especially related to the need for long-term financing for business model transformation, technological innovation, and green infrastructure development. This study aims to examine in depth the role of green bonds and sustainable finance in accelerating the transition to a circular economy. The method used is a systematic literature study and descriptive analysis of secondary data from regulatory agencies, corporations, and international organizations. The results of the study show that green bonds play an important role as a financing instrument that supports environmentally friendly projects, as well as being able to improve ESG scores, strengthen corporate reputation, and reduce the cost of capital. In addition, the wider application of sustainable finance through the integration of ESG principles can strengthen investment governance and promote structural transformation towards a regenerative economic system. However, this study also found that there are still barriers such as greenwashing, limited feasible circular projects to finance, and low green finance literacy among market participants. Therefore, strengthening the policy framework, developing fiscal incentives, and multi-stakeholder collaboration are needed to create a green finance ecosystem that supports the acceleration of an inclusive and sustainable circular economy.

Keywords: green bonds; sustainable finance; circular economy; economic transition; and ESG

INTRODUCTION

Climate crisis, environmental degradation, and massive exploitation of natural resources have pushed the world to review the global economic model that has been dominated by a linear approach of production, consumption, and disposal. Not only has this model proven unsustainable, but it has also exacerbated social inequality and ecological degradation. As an alternative, the concept of circular economy emerges by offering a more regenerative approach, based on the principles of reduce, reuse, and recycle (3R), and aims to extend the life cycle of products and materials to reduce pressure on natural resources.

However, the transition to a circular economy is not without its challenges. Significant, specialized, and long-term financing is required to support technological innovation, business model change, and green infrastructure development. This is where the role of green bonds and sustainable finance becomes crucial. Green bonds, as a financing instrument allocated specifically for environmentally-oriented projects, have shown significant global growth. In Indonesia, this initiative has started to grow since the launch of the Sustainable Finance Roadmap by the Financial Services

Authority (OJK) in 2018. Nonetheless, the integration of green bonds in supporting the circular economy is still relatively limited in practice and academic literature.

This study aims to examine in depth the role of green bonds and sustainable finance practices in accelerating the transition to a circular economy in Indonesia. This study specifically analyzes the relationship between green bond issuance, regulatory policies, and circularity-based business model transformation, through a systematic literature study approach and descriptive analysis of secondary data from regulators, companies, and international institutions.

The theoretical contribution of this research is to enrich the discourse of literature in the field of green finance, especially its relationship with circular economy strategies, which are still minimally studied in the context of developing countries. While from the practical side, this research provides policy recommendations and implementative strategies for governments, regulators, and capital market players to optimize the use of green bonds in promoting a sustainable, inclusive, and resilient economy to environmental risks.

The novelty of this study lies in the explicit focus on the integration of green bonds with the circular economy framework, which has not been widely touched upon in previous research in Indonesia. This study not only sees green bonds as a financing tool, but also as a policy instrument capable of directing investment towards structural transformation in the national economic model.

LITERATURE REVIEW

1. Green Bond

According to ICMA, 2021 explains that Green bonds or green bonds are part of innovations in the financial system that aim to support sustainable development. Conceptually, green bonds are debt instruments issued to finance projects that provide positive benefits to the environment, such as renewable energy, energy efficiency, water and waste management, and environmentally friendly transportation. In theory, green bonds can be viewed from several perspectives as follows:

A. *Sustainable Finance Theory*

According to Schoenmaker and Schramade (2019) in their book *Principles of Sustainable Finance*, sustainable finance focuses on long-term value creation by taking into account risks and opportunities related to sustainability. In this context, green bonds act as an instrument that enables capital allocation for projects that support the transition to a green and low-carbon economy.

Green bonds become a medium that connects financial objectives (profitability) and sustainability objectives (environmental protection). Thus, this instrument is not only a means of financing, but also a concrete representation of the application of ESG principles in the capital market.

B. *Signaling Theory*

According to Flammer (2021) in the *Journal of Financial Economics*, companies that issue green bonds tend to show an increase in ESG scores and more easily access institutional investors who focus on responsible investing. In other words, green bonds become a reputational tool that shows the company's credibility in implementing sustainability principles.

C. *Theory of Investor Preference for ESG*

In recent years, a theory has developed that investors have a preference for companies that apply environmental, social and good governance principles. Hartzmark and Sussman (2019) found that fund flows to ESG-based mutual funds increased significantly, indicating that investors' preference for sustainability issues is starting to influence market behavior.

Green bonds reflect this preference as they offer financial returns along with added environmental value. According to the Climate Bonds Initiative (2022), although green bond yields are relatively comparable to conventional bonds, investors are willing to accept slightly

lower yields due to their belief in the social and environmental impacts generated. This strengthens the position of green bonds as a relevant asset in sustainable portfolios.

D. Green Bond Standards and Principles

In practical terms, green bonds are based on frameworks developed by international organizations. The International Capital Market Association (ICMA) published the Green Bond Principles (2021), which sets out four key principles: (1) use of proceeds, (2) project evaluation and selection process, (3) management of proceeds, and (4) transparent reporting. These principles are designed to ensure the integrity of green bonds and give investors confidence in the allocation and use of funds.

In addition, the Climate Bonds Initiative (CBI) provides a certification and taxonomy of projects that are in line with global climate ambitions. The existence of these standards is important to avoid greenwashing practices, which are false or exaggerated claims regarding the environmental impact of financed projects.

2. Sustainable Finance

Sustainable finance is a financial approach that integrates environmental, social, and governance (ESG) aspects into the investment and financing decision-making process. The concept emerged in response to the growing awareness of the impact of climate change, social inequality and weak corporate governance on long-term economic stability. In practice, sustainable finance includes various instruments such as green bonds, social bonds, ESG investing, and impact investing.

A. Stakeholder Theory

The conceptual foundation of sustainable finance can be traced to stakeholder theory, developed by R. Edward Freeman (1984). This theory states that companies are not only responsible to shareholders, but also to all stakeholders who are directly or indirectly involved, including the community, government, and the environment. In the context of sustainable finance, companies and financial institutions must take into account the impact of their economic activities on environmental sustainability and social welfare.

This approach rejects the traditional notion of Milton Friedman (1970), which states that the only corporate social responsibility is to increase profits. Instead, stakeholder theory emphasizes the need for a balance between economic, social, and ecological goals.

B. Triple Bottom Line Theory

Another theory underlying sustainable finance is the Triple Bottom Line introduced by John Elkington (1997), which includes three main dimensions: profit, people, and planet. This concept forms the basis of thinking in many sustainability frameworks, including sustainable financial reporting practices and responsible investment strategies.

According to Elkington, companies and investors that pursue only financial returns without considering social and ecological impacts risk undermining long-term value. Therefore, sustainable finance demands a broader accountability that adds value to the environment and society in addition to creating economic returns.

C. Systemic Risk Theory and ESG Integration

In the modern financial framework, environmental and social risks have been recognized as systemic risks that can destabilize the global economy. The study by Schoenmaker and Schramade (2019) in the book *Principles of Sustainable Finance* emphasizes the importance of integrating ESG factors into financial risk assessment. They argue that climate change, social conflict, and corruption are non-traditional risk factors that have real financial impacts. ESG integration is not only an ethical approach, but also an economic one. This is reinforced by empirical studies such as Friede, Busch, and Bassen (2015) in the *Journal of Sustainable Finance & Investment*, which analyzed more than 2,000 studies and found that most showed a positive relationship between ESG performance and corporate financial performance.

D. Principles of Global Sustainable Finance

The implementation of sustainable finance globally is supported by international frameworks and principles, such as:

- a. UN Principles for Responsible Investment (PRI)
Establishes six guiding principles for institutional investors to integrate ESG in investment decisions.
- b. Equator Principles
Used by financial institutions to manage social and environmental risks in project finance.
- c. Task Force on Climate-related Financial Disclosures (TCFD)
Promotes corporate transparency in disclosing risks and opportunities associated with climate change.

These principles underpin sustainable finance regulation and practice in many countries and multilateral financial institutions.

3. Circular Economy

The circular economy is a modern economic approach that aims to replace the traditional linear economic model that has dominated - take-make-dispose. The concept seeks to create a more efficient, regenerative, and sustainable economic system, emphasizing the principles of waste reduction, recycling, reuse, and durable product design. The circular economy is not just a waste management practice, but a systemic transformation of the way we produce and consume.

According to the Ellen MacArthur Foundation (2013), a circular economy is an economic system that is restorative and regenerative, aiming to preserve the value of products, materials and resources for as long as possible. Different from the linear economic model (take-make-dispose), the circular economy emphasizes the principles of reduce, reuse, recycle (3R) and industrial symbiosis. This concept supports the sustainable development goals (SDGs), particularly SDG 12 (sustainable consumption and production). Stahel (2016) emphasized that the circular economy is not just an environmental strategy, but a systemic economic approach that can create new economic value, jobs, and reduce dependence on limited resources.

The circular economy stems from a critique of the linear economic model that relies on the extraction of large amounts of natural resources to produce products that ultimately end up as waste. This model does not take into consideration the planet's limitations and causes great stress to the environment, such as pollution, climate change, and biodiversity degradation.

In their book *Waste to Wealth* (2015), Accenture's Peter Lacy and Jakob Rutqvist argue that the linear economic model is no longer sustainable amidst rapid global population growth and consumption. They emphasized the need for a new approach that creates "value from waste" through technology and circularity-based business model innovation.

According to the Ellen MacArthur Foundation (2013), the circular economy rests on three main principles:

- a. Design to reduce waste and pollution
- b. Keeping products and materials in the cycle of use for as long as possible
- c. Regeneration of natural systems

This approach emphasizes that products should be designed to be reused, repaired, and eventually recycled, thus extending the life cycle of materials and reducing dependence on new resources. This concept is supported by the *closed-loop system* theory first developed by Walter R. Stahel in *The Product-Life Factor* (1982), which emphasizes the importance of product life extension and external cost reduction.

The circular economy is closely related to the theory of regenerative economy, the idea that economic systems should not only be "neutral" towards nature, but also repair the damage that has been done. This approach was first raised by William McDonough and Michael Braungart

in their book *Cradle to Cradle: Remaking the Way We Make Things* (2002). In the book, they proposed that every product should be designed from the start to return to nature without polluting it or being reused in the industrial cycle.

RESEARCH METHOD

This research used a descriptive qualitative approach with a literature study method. The literature study was conducted by in-depth reviewing various scientific sources, including academic journals, international agency reports, national regulatory policies, and conceptual literature relevant to the topics of green bonds, sustainable finance, and circular economy. These sources were selected based on their relevance, credibility and currency of publication, with a focus on literature published in the last ten years.

Meanwhile, secondary data analysis was conducted by extracting information from official documents of regulatory agencies such as OJK, the Ministry of Finance, as well as reports from organizations such as the World Bank, ICMA, and the Climate Bonds Initiative. The data analyzed includes trends in green bond issuance, supporting fiscal policies, as well as regional and global initiatives related to green financing. The analysis techniques used are narrative and thematic, with the aim of identifying patterns, the strategic role of green bonds, as well as challenges and opportunities for implementation in accelerating towards a circular economy in Indonesia.

RESULT AND DISCUSSION

In recent decades, climate change has become a global issue that demands concrete responses from various sectors, including finance. One important innovation in supporting the financing of environmentally friendly projects is green bonds. Green bonds are debt instruments issued to finance or refinance projects that provide environmental benefits, such as renewable energy, energy efficiency, waste management, and low-carbon development (World Bank, 2015).

The basic concept of green bonds is in line with the principles of sustainable finance, which integrates environmental, social, and governance (ESG) considerations into investment decisions. According to Flammer (2021), green bonds are not only a financing tool, but also a signal of the issuer's commitment to long-term sustainability. The issuance of green bonds provides a positive signal to the market about the company's concern for environmental issues, which can improve reputation while expanding the investor base.

Empirical studies show that green bonds have an impact on the company's financial performance. Flammer (2021), in his research published in the *Journal of Financial Economics*, states that companies that issue green bonds show an improvement in ESG performance and gain access to capital at a relatively lower cost. This is supported by a study from Karpf and Mandel (2018), which states that although there is little difference in yield between green bonds and conventional bonds, investors are willing to accept slightly lower yields due to the non-financial added value offered. Zerbib (2019) in his research published in the *Journal of Banking & Finance*, found that green bonds have a cost of capital advantage over conventional bonds, albeit on a small scale. Zerbib analyzed the global bond market and concluded that green bonds generally trade with a lower yield of 2 basis points, reflecting the green premium, which is the desire of investors to accept lower yields because of the sustainability value offered. Tang & Zhang (2020) in a study published in the *Journal of Financial Economics*, examined the effects of green bond issuance on companies in China. They found that green bond issuance is associated with an increase in ESG scores, an increase in firm value, and an increase in stock liquidity. This strengthens the argument that green bonds not only impact the financing structure, but also reflect the company's commitment to sustainability, which is positively valued by the market.

Gianfrate & Peri (2019) in their article in the *Journal of Cleaner Production* also showed that green bonds can lower the cost of debt and improve corporate reputation. The study shows that

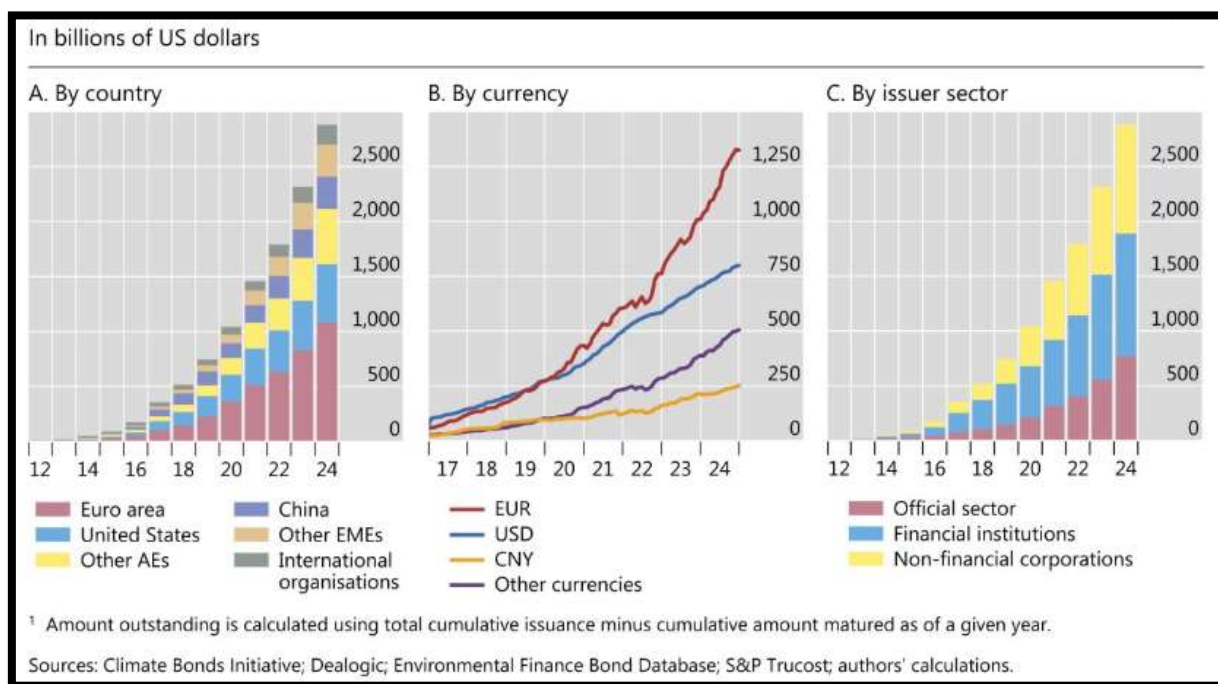
companies active in the green bond market experience a significant reduction in the cost of debt due to increased positive perceptions from institutional investors and the public.

On the regulatory side, the Climate Bonds Initiative (CBI) has developed the Climate Bonds Standard and Certification Scheme, which provides guidance and certification for projects that meet environmental criteria. This standard strengthens transparency and accountability in the use of funds obtained from green bonds. At the global level, the International Capital Market Association (ICMA) published the Green Bond Principles (2021), which is the main reference in green bond issuance. These principles cover four main components: use of proceeds, project evaluation and selection process, proceeds management, and reporting.

The EU has become one of the leaders in the green bond market through the implementation of the EU Green Bond Standard, which aims to increase transparency and investor confidence. In addition, the NextGenerationEU Recovery Plan launched after the COVID-19 pandemic stipulates that around 30% of funding will be obtained through green bonds (European Commission, 2021). In the United States, green bonds are widely issued by local government agencies (municipal bonds) for transportation and clean water management projects.

The trend or growth of Green Bond issuance in the world can be seen in the following graph:

Picture 1. Trend Or Growth Of Green Bond Issuance In The World



Source : Climate Bond Initiative

From the graph, the volume of Green Bond has increased exponentially since 2012, both in terms of the issuing country, the currency used, and the sector that issued it.

A. Growth by country

Graph A shows the growth of Green Bond accumulation by region or issuing country from 2012 to 2024. The European region and the United States are the main players in Green Bond issuance, with volumes consistently increasing from year to year. In addition, China has also shown significant growth, reflecting the country's active role in green financing. International organizations and *Emerging Market Economies* (EMEs) have also started to contribute on a larger scale, signaling that sustainable financing efforts have become a global agenda, not just the preserve of developed countries.

B. Growth by currency

Chart B shows Green Bond issuance by currency. Here, the Euro (EUR) dominates, followed by the US Dollar (USD), Chinese Yuan (CNY), and other currencies. Since 2022, issuance in euros has seen a particularly sharp spike, reflecting the region's preference for sustainable finance. The use of euros over the US dollar also indicates that Europe may be more aggressive in promoting the green energy transition through financial instruments. Meanwhile, the increase in CNY usage demonstrates China's efforts to increase the role of its currency in the global green finance market.

C. Growth by issuing sector

Chart C illustrates the growth of Green Bonds by issuer sector. Non-financial corporations have been the largest contributor to Green Bond issuance in recent years. This reflects the increasing awareness and responsibility of corporations towards sustainability issues. The financial sector also plays an important role as a conduit of funds, while the official sector (government and public institutions) shows steady growth. This suggests a synergy between the public and private sectors in supporting the green agenda. Globally, according to the Climate Bonds Initiative report (2023), the renewable energy sector is the largest sector in green bond issuance at 30%, followed by low-carbon transportation at 22% and green buildings at 15%.

Asia as the region with the fastest economic growth has also begun to show a significant increase in green bond issuance. China is a major player in the region and even globally. The Chinese government issued the Green Bond Endorsed Project Catalogue and established a strict framework for green project supervision. According to the Asian Development Bank (ADB, 2021), China accounts for more than 30% of total green bond issuance in Asia.

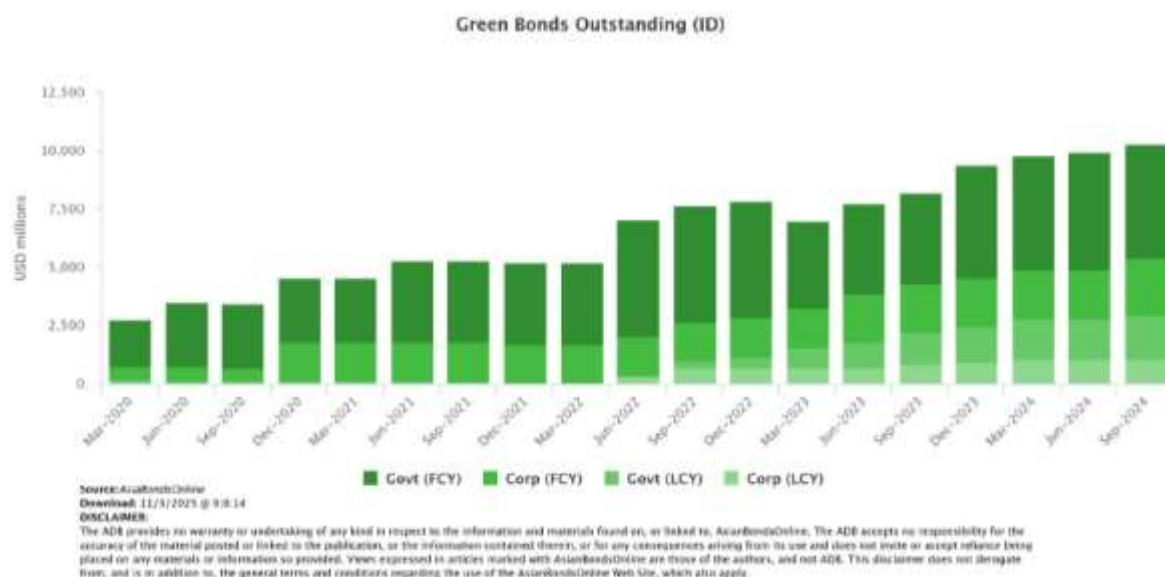
Japan and South Korea are also active in promoting green bonds, especially from the private sector and financial institutions. The Japanese government, through its Green Transformation (GX) Strategy, encourages low-carbon investment, including the issuance of sovereign green bonds. South Korea developed the Green New Deal initiative as part of its post-pandemic green economic recovery.

In addition, ADB itself has issued green bonds since 2015 and continues to provide technical and financial support to its member countries to strengthen the green bond market. ADB also notes that the main challenges in Asia are the lack of large-scale green projects and local investors' lack of understanding of green instruments (ADB, 2021).

ASEAN as a region with high infrastructure needs is starting to adopt green bonds to fund sustainable projects. The Philippines, Malaysia and Thailand have also issued green bonds, both by the government and the private sector. Malaysia's central bank and Securities Commission Malaysia issued the SRI Sukuk Framework to support the issuance of sharia-based green bonds. In Thailand, the Government through the Thai PDMO (Public Debt Management Office) issued green bonds to finance environmentally friendly transportation development projects. The ASEAN+3 Bond Market Forum together with the Asian Bond Markets Initiative (ABMI) has developed the ASEAN Green Bond Standards (2017) which adopts principles from ICMA and adapts them to regional needs. These standards promote market harmonization and facilitate cross-border trading.

In Indonesia, the role of green bonds began to grow after the issuance of the first green bond by the government in 2018, with the aim of funding climate change projects. Based on Indonesia's Green Bond & Green Sukuk Initiative document (Ministry of Finance of Indonesia & UNDP, 2028), green sukuk is used to finance nine green sectors including renewable energy, energy efficiency, sustainable transportation, waste management, sustainable agriculture, green building, green tourism, natural resource management and climate resilience. The Financial Services Authority (OJK) has also released the Sustainable Finance Roadmap, which supports the implementation of green finance and encourages financial institutions to integrate sustainability aspects into their business strategies (OJK, 2019). In addition, regulations related to green taxonomy are also being developed to clarify the classification of environmentally friendly economic activities. The following is the trend of green bond issuance in Indonesia.

Picture 2. Trend Of Green Bond Issuance In Indonesia



Source: asianbondsonline.org

Indonesia, as a developing country vulnerable to climate change, has shown a significant increase in the use of green bonds by both the government and private sectors. The chart released by AsiaBondsOnline provides a quantitative overview of the development of green bonds outstanding in foreign and local currencies from March 2020 to September 2024.

The chart shows a consistent upward trend in the value of outstanding green bonds since March 2020. At the beginning of the March 2020 period, the total value of green bonds was still below USD 5 billion, but continued to increase until it reached more than USD 11 billion in September 2024. This reflects the growing commitment of Indonesia's public and corporate sectors in financing green projects.

Until 2024, foreign currency government green bonds (Govt FCY) remain the dominant component. This is in line with Indonesia's position as a global sovereign green sukuk issuer, attracting investors from international Islamic markets and Asia. However, since 2022 there has been an increasing contribution from corporate green bonds, both in foreign and local currency. This indicates active participation from the private sector, including the energy, banking and infrastructure sectors, in supporting the green economy. The significant increase occurred from mid-2022, especially after the government increased the issuance of Green Sukuk and started to include more green infrastructure and renewable energy projects in the sustainable financing scheme.

Although green bonds are showing a positive trend, there are still challenges in their implementation, such as greenwashing, limited viable projects, and lack of incentives for the private sector to issue green bonds. Therefore, collaboration between the public and private sectors, technical capacity building, and strengthening of policies and frameworks are necessary to foster credible and sustainable growth of the green bond market.

However, the challenges of green bond implementation in ASEAN still revolve around limited technical capacity, lack of domestic investor awareness, and the need for fiscal and non-fiscal incentives. Indonesia's Financial Services Authority (OJK) and the Monetary Authority of Singapore (MAS) have taken progressive steps through sustainable finance roadmaps and tax incentives to strengthen the green finance ecosystem.

The implementation of a circular economy relies heavily on technological innovation and industrial restructuring, all of which require substantial funding. This is where green bonds come into play in providing a source of long-term financing for projects such as waste treatment, recycling, renewable energy, product redesign, and resource efficiency.

Gianfrate & Peri (2019) stated that green bonds have a strategic role in supporting the circular economy by accelerating investments in green infrastructure and circularity-based business models. In addition, green bonds also increase investor awareness of the importance of sustainability in investment.

Meanwhile, the European Investment Bank (EIB, 2020) report emphasized that sustainable finance should explicitly integrate circular economy projects into the green investment framework in order to achieve economic system transformation.

CONCLUSIONS AND SUGGESTIONS

1. Conclusion

The transition to a circular economy is a necessity in facing the challenges of climate crisis, environmental degradation, and unsustainable exploitation of natural resources. In this context, green bonds and sustainable finance play an important role as strategic instruments that not only serve as alternative sources of financing, but also as drivers of systemic transformation in economic policies and business models.

Based on the literature study and empirical analysis, it can be concluded that green bond issuance is proven to contribute to the improvement of corporate ESG performance, reputation strengthening, as well as access to more efficient capital costs. On the other hand, sustainable finance through ESG principles, stakeholder theory, and the triple bottom line, encourages the integration of social and environmental dimensions into investment decisions. This creates synergy between economic and sustainability objectives.

Within the circular economy framework, green bonds act as a catalyst in funding projects that support recycling, energy efficiency, environmentally friendly product design, and clean technology development. This role is increasingly relevant as global and regional commitments to low-carbon development increase. International studies from Flammer (2021), Gianfrate & Peri (2019), and Tang & Zhang (2020) provide empirical evidence that green bonds are effective in driving green innovation and capital market behavior change towards a more sustainable direction.

However, challenges such as limited feasible projects to finance, greenwashing risks, and lack of green finance literacy are still obstacles in optimizing this instrument, especially in developing countries such as Indonesia. Therefore, there is a need to strengthen regulations, increase technical capacity, and harmonize strategies across sectors to create an inclusive and credible green finance ecosystem.

2. Suggestion

- a. Strengthening Regulations and Fiscal Incentives
The government and regulators need to clarify and strengthen the green bond regulatory framework and implement fiscal incentives that encourage the private sector to actively participate. For example, through tax holidays, interest subsidies, or tax deductions for circular economy projects financed through green bonds.
- b. Integration of Green Bond into National Circular Economy Strategy
Green bonds should be explicitly included in national development planning and circular economy roadmaps. This includes synchronization between the green taxonomy, green activity classification system, and national priority projects.
- c. Improved Literacy and Technical Capacity
Systematic efforts are needed to improve the understanding of stakeholders including market participants, local governments, and the public on the benefits and mechanisms of green bonds and sustainable finance. Workshops, training, and technical support from international institutions can accelerate this process.
- d. Multi-stakeholder Collaboration and Innovative Partnerships

Accelerating the circular economy transition requires collaboration across sectors, including government, capital market players, academia, NGOs, and donor agencies. The public-private partnership model can be a solution in financing large-scale circularity-oriented projects.

e. Development of Monitoring and Evaluation System

To prevent greenwashing practices and ensure transparency, a data-driven monitoring and evaluation system needs to be developed, with international standardized reporting such as TCFD and CBI. This is important so that investors remain confident in the effectiveness and real impact of green bonds.

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