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Transforming financial systems for sustainability: The role of green financing in social-environmental progress and economic resilience

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ABSTRACT

Background: Amid the challenges of climate change and the escalating global environmental crisis, the concept of a green economy has become crucial in achieving sustainable development. A green economy aims to generate economic value without harming the environment while improving social well-being. In this context, green finance plays a vital role in supporting investments in environmentally friendly projects and sustainable businesses. Green financing refers to funds allocated for projects and programs aimed at environmental protection and fostering sustainable economic growth. **Method:** This article explores research on green financing, including international observations on the challenges of environmental financing and proposed solutions for green finance. The challenges of environmental financing in Indonesia are also analysed from a legal perspective. Furthermore, this research aims to examine how the banking sector participates in supporting green project financing in Indonesia. **Findings:** Findings indicate that funding for green projects can significantly impact the environment, society, and climate change mitigation efforts. However, numerous issues remain, such as a lack of understanding regarding financing environmentally friendly projects, varying definitions of green financing, insufficient coordination in policy frameworks related to environmental financing, misaligned policies, and a lack of incentives for investors and financial institutions interested in climate change mitigation. The objective of green financing is to provide funding for projects or developments that balance economic, social, and environmental considerations. **Conclusion**: The Indonesian government has issued regulations on the implementation of sustainable finance for commercial banks to support green financing. These regulations are also applicable to financial service institutions, issuers, and publicly listed companies. The study's findings suggest that Bank Indonesia and the Financial Services Authority/*Otoritas Jasa Keuangan* (OJK) have regulations that influence lending, credit, and investment policies. Indonesia's legal framework for environmentally friendly financing appears promising, supported by the collaborative efforts of the business sector and the government in advancing sustainable finance. **Novelty/Originality of this Article:** This study contributes a legal and institutional perspective on green financing in Indonesia by analyzing regulatory support and challenges, offering a distinctive national lens often underrepresented in global green finance literature.

KEYWORDS: green financing; sustainable; investment; banking; net zero emission.

1. Introduction

Climate change is currently a critical issue facing the world. It has caused severe impacts on all living beings, including floods, storms, food scarcity, and the risk of extinction for plants and animals (Delbeke et al., 2019). According to data from the Emission Database for Global Atmospheric Research (EDGAR), Indonesia ranked eighth among the highest

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carbon-emitting countries in 2022 (Crippa et al., 2022). To meet the global net-zero emission target by 2050, the Indonesian government must significantly reduce its carbon emissions. Indonesia has demonstrated its commitment to reducing carbon emissions through its ratification of the Paris Agreement. Meanwhile Indonesia just set the target for its Net Zero Emmision by 2060. This gap develop some problems in arrangement fot Paris Agreement. This commitment is formalized in Law No. 16 of 2016 on the Ratification of the Paris Agreement to the United Nations Framework Convention on Climate Change as written in Republic of Indonesia 2016 regulation. Furthermore, to reinforce its determination to achieve net-zero emissions, the Indonesian government has outlined a low-carbon development action plan in Presidential Regulation No. 18 of 2020 concerning the 2020–2024 Medium-Term Development Plan Republic of Indonesia 2020 regulation. The increasing demands of society and population growth, often neglecting environmental concerns, have made the global economy overly dependent on fossil fuels, leading to excessive environmental pollution. Human health is significantly impacted by environmental hazards. In recent years, many experts have advocated for the concept of a green economy and energy transition as widely accepted solutions. These concepts emphasize reducing the use of non-renewable fossil fuels and transitioning to renewable energy sources (Shaikh & Aspiranti, 2023).

The transition toward a sustainable national energy system is a critical development issue in Indonesia. Following the Paris Agreement of 2015, participating countries agreed to mitigate global warming as a response to climate change. Awareness of environmental importance and climate change is increasing, given the serious consequences of global warming, such as natural disasters like floods, droughts, and typhoons, which pose significant threats to human life (Hadi et al., 2022; Setiawan et al., 2021). International agreements play a significant role in addressing climate change, highlighting how central banks can facilitate the transition to sustainability by strengthening environmentally conscious financial initiatives. The concept of a green economy, introduced by the United Nations Environment Programme (UNEP) in 2008, integrates economic gains with environmental stewardship through eco-friendly economic activities and efficient resource use (Drajat, 2023).

This article discusses research related to green finance. Through this review, the author identifies the most common research topics in the literature on environmentally friendly finance and recommends key areas for further investigation in academic discussions and green finance policymaking. Generally, green finance refers to the mobilization and utilization of funds for activities that protect the environment while ensuring fair returns for investors or lenders (Ozili, 2022). The objective of green finance is to increase the flow of funds from financial institutions to economic agents involved in projects and activities aimed at preserving the environment to achieve sustainable development as citated in Binus Green Finance Modul Book.

The necessity of reducing the negative environmental impacts of fossil fuel emissions has driven efforts to divest from fossil fuels and shift investments toward low-carbon projects and activities that sustainably protect the environment (Bergman, 2018). This call for action has had implications at both national and international levels. Many countries, including Canada, Japan, Mexico, and the United Kingdom, have implemented policies to raise public awareness about the detrimental effects of fossil fuel emissions on the climate and the risks associated with climate change (Ozili, 2022). On a global scale, countries have signed the Paris Agreement, a legally binding international accord addressing climate change mitigation efforts (Tsai, 2024).

Green financing involves channeling investments into sustainable development projects, environmental products, and policies that promote a sustainable economy. It represents a financing or loan scheme for businesses adopting environmentally friendly practices. Several Asian countries, such as Singapore and China, have already implemented green financing practices in their banking sectors. For example, the People's Republic of China, one of the world's largest industrial nations, introduced its Green Credit policy in 2007. This policy regulates loans granted for environmentally friendly projects, later

termed "Green Financing." Indonesia has also begun integrating green financing into its banking sector, driven by a rising trend across Asian countries, particularly in Southeast Asia, to support sustainable development (Trihadmini, 2018).

The Paris Agreement aims to limit the rise in global temperatures to below 2°C, preferably 1.5°C. Members of the UN Climate Change Conference of the Parties (COP26) have pledged to reduce greenhouse gas emissions. Achieving the goals of the Paris Agreement and COP26 mandates requires significant financial resources, commonly referred to as green finance or environmentally friendly financial instruments (Tsai, 2024). Transitioning to a low-carbon or environmentally friendly economy demands additional funding to support the burgeoning green economic growth (Volz, 2017). Advocates of the green economy propose green financing as a solution to meet the funding needs of individuals, businesses, and governments committed to environmentally friendly or low-carbon activities (Ozili, 2022).

A legal examination will be conducted to explore Indonesia's regulatory framework supporting environmentally friendly finance. This analysis will aid policymakers and practitioners in decision-making. The framework proposed by (Volz, 2017) will be utilized to assess the sustainable financial governance of Indonesia's central bank. This framework provides a systematic approach to evaluating sustainable financial regulations and understanding the rules governing sustainable financial instruments. Using Volz's legal instrument framework, Bank Indonesia and the Financial Services Authority/*Otoritas Jasa Keuangan* (OJK) influence lending, loan policies, and investment decisions within the realm of green finance. The analytical framework evaluates the extent to which legal instruments contribute to promoting sustainable financial practices and supporting the transition to a low-carbon economy in Indonesia (Nursahla et al., 2023). Green financing schemes have already been adopted by several financial institutions in Indonesia.

The Financial Services Authority/*Otoritas Jasa Keuangan* (OJK), as the regulator and supervisor of the financial services industry, introduced the Sustainable Finance Roadmap in 2015. This initiative marked a commitment to implementing sustainable finance as a step toward supporting a green economy. The roadmap aligns with established principles from the Global Reporting Initiative (GRI) and the Sustainability Framework developed by the International Financial Corporation (IFC). OJK aims to involve financial industries such as banking, capital markets, and non-bank financial institutions/*Industri Keuangan Non Bank* (IKNB) in sustainable finance. It provides insights into financial service products supporting sustainable development, including green financing. The green movement has grown increasingly popular, becoming a rising trend among consumers. This encompasses green labels, green products, green packaging, green consumers, green businesses, green banking, and more—each addressing environmental management issues driven by market demand for environmental conservation. Green business, in particular, represents efforts by enterprises to preserve the environment while conducting their operations. Initially, environmental management was based on the concept of environmental carrying capacity. However, as natural ecosystems have become incapable of absorbing increasing levels of pollution, the approach has shifted from pollution control to pollution prevention. Industries are now expected to actively participate in environmental stewardship, including adopting green business concepts.

2. Methods

This study adopts a normative research approach supported by empirical data. It is exploratory in nature, aiming to investigate new phenomena that have been insufficiently explored in prior research. The study focuses on analysing aspects of Green Finance in Indonesia and incorporates the application of the legal instrument framework proposed by Volz. This framework facilitates the study of environmentally sustainable finance laws and the regulations governing such financial instruments. The research utilizes this framework to analyse the regulatory tools and mechanisms employed by Bank Indonesia and the Financial Services Authority/*Otoritas Jasa Keuangan* (OJK) to influence lending, loan

policies, and investment decisions within the green finance sector. The methodology used in this study is designed to comprehensively understand the legal framework governing sustainable finance in Indonesia and to evaluate how regulations can promote sustainable financial practices and support environmental protection goals. The study seeks to identify and present information regarding the potential implementation of green financing in Indonesia by drawing on green financing practices already implemented in various countries. The data is sourced from diverse literature, including articles from international journals, books, and working papers, to examine the types of green financing policies applied in these countries. Furthermore, a scoping review method is employed to identify and present information from international literature, including journal articles and working papers, that analyse the relationship between green financing and environmental health in countries that have implemented such financing. These reviews are used as a comparative basis to analyse the impact of green financing implementation on reducing carbon emissions in Indonesia.

The research employs a literature-based approach. The literature study method involves collecting data from scholarly sources, reading, documenting, and processing research materials. This method is utilized to explain theories relevant to the research problem, serving as a foundation for discussing the study's findings. In general, a literature study addresses research problems by examining existing works, commonly referred to as "library research." The review includes journal articles, industry practitioner papers, and policy reports. Articles were selected manually, with systematic searches conducted using Google Scholar to identify abstracts and content containing keywords such as green finance, green bonds, and sustainable financing. Theses and dissertations were excluded from the review. Additional searches were conducted using Google to locate relevant white papers and policy reports. A 2023 publication cutoff was applied to ensure the review reflects the most recent research in the field of green finance literature.

3. Results and Discussion

The number of scholarly articles focusing on green finance remains limited. The latest findings on Green Financing, as analysed in this article, are presented in Table 1.

Table 1. The latest findings on green financing (2023–2024)

Title	Authors	Journal	Key Findings
Green Finance in Indonesia: An Overview	(Yunus et al., 2023)	Management Studies and Entrepreneurship Journal (MSE) 01 (2), July 2024	The analysis of environmental finance aspects in Indonesia using the legal instrument framework proposed by Volz has provided valuable insights into the regulatory landscape governing environmental finance instruments in Indonesia. This study highlights various regulatory tools available to Bank Indonesia and the Financial Services Authority (OJK) to influence lending, lending policies, and investment choices in the field of environmental finance.
Green Financing: Accelerating Sustainable Development to Achieve Net Zero Emission	(Pratama et al., 2024)	Journal of Law, Administration, and Social Science	Benchmarking results from countries that have implemented green finance, such as South Korea and Singapore, indicate that the types of green finance policies that can be applied include the provision of green loans, the issuance of green bonds, the establishment of special funds such as the State-Owned Environmental Fund, and financial assistance for industries with good environmental management performance. Furthermore, research findings from several countries show

			that the implementation of green finance plays a significant role in reducing carbon emissions.
Literature Review on Green Finance in Several Countries	(Rangkuti et al., 2024)	Management Studies and Entrepreneurship Journal (MSE) 01 (2), July 2024	This paper presents a literature review of green finance research and identifies several areas that are beneficial for future research. The findings indicate that green finance has the potential to make a significant difference to the environment and society. However, there are still many challenges, such as a lack of awareness, inconsistent definitions, a lack of policy coordination, inconsistent policies, and a lack of incentives for investors and financial institutions, among others.
The Role of State-Owned Banks in the Green Finance Program	(Mukhry et al., 2024)	Management Studies and Entrepreneurship Journal (MSE) 01 (2), July 2024	The implementation of green finance regulations aims to reduce social inequality, prevent environmental damage, preserve biodiversity, and promote the efficient use of energy and natural resources. As state-owned and private corporations, the banks mentioned above are expected to serve as role models in adopting environmentally conscious banking practices in response to regulatory demands and efforts to meet the expectations of their stakeholders.
Designing a Business Plan in the Green Economy Era: The Contribution of Green Finance to Sustainable Business Success	(Shabrina, 2024)	Binus University Business Journal	This article concludes that the implementation of green finance in business plans is crucial for the success of sustainable businesses in the green economy era. Effective integration of green finance and business planning can enhance long-term sustainability, reduce financial and environmental risks, and strengthen competitiveness. Overall, green finance is an essential element in business planning for those looking to thrive in the green economy era and presents opportunities for sustainable business growth.
Green finance and renewable energy growth in developing nations: A GMM analysis	(Chen, 2024)	Heliyon Journal	This research aims to examine the interrelationship between green finance and its influence on the renewable energy industry in a sample of 30 developing nations from 1990 to 2018. The main aim of this study is to investigate the interconnected effects between green bonds, investments in renewable energy, and carbon markets, with a specific emphasis on the influence of the banking system in shaping these interrelationships. To accomplish this objective, the Generalized Method of Moments (GMM) is utilized to examine the data and comprehend the intricate interrelationships among the variables.
Do green banking practices improve the sustainability performance of banking institutions? The mediating	(Kumar, 2024)	Emerald Insight	This study aims to examine the mediating role of green finance in the relationship between green banking practices and the sustainability performance of banking institutions in developing economies. The authors performed an empirical investigation by applying the "partial least squares structural equation modeling (PLS-SEM)" based on a representative sample of 414 bank employees

role of green finance			working in the National Capital Region, India. The study's outcome confirms that employee, top-management, operation and policy related practices substantially influence green finance and banks' sustainability performance. On the contrary, customer related practices insignificantly influence banks' sustainability performance. Further, green finance substantially influences the sustainability performance of banking institutions.
Driving sustainable growth: exploring the link between financial innovation, green finance and sustainability performance: banking evidence	(Hussain, 2024)	Emerald Insight	This research paper aims to explore the link between financial innovation (FINV), green finance (GRF) and sustainability performance (SUSP) with the overarching objective of driving sustainable growth. The purpose is to understand how the integration of FINV and GRF can contribute to improved SUSP for businesses and organizations. The study adopts a survey-based approach, synthesizing existing scholarly works, empirical studies and industry reports. It examines the theoretical foundations and empirical evidence to understand the relationship between FINV, GRF and SUSP. The findings highlight a positive relationship between GRF and SUSP. GRF acts as a catalyst for FINV by providing the necessary financial resources and incentives for organizations to invest in sustainable technologies and practices. It enables businesses to enhance their SUSP by adopting environmentally friendly processes, reducing carbon emissions and promoting resource efficiency. The integration of FINV and GRF fosters sustainable growth by aligning economic, environmental and social objectives.
Green finance: between commitment and illusion	(Chenguel, 2024)	Emerald Insight	After almost 10 years, people wonder if green finance has been able to attain its objectives in terms of controlling climate change. Persistent global warming and climate deregulation manifested by melting glaciers, droughts and floods, are all of these determinants that have called into question the efficiency of green finance. Green finance is a way to support climate action through investments. It has proven that this is a viable financial instrument and that it can be used by governments and private companies to plan for the future of our planet. Based on an analysis of articles published in top international journals from 2016 to 2022, about the relationship between green technology and financial services in China, this paper aims to present an overview of green finance, its importance for the planet, its objectives and its instruments.
Green banking practices and environmental performance: navigating	(Gulzar, 2024)	Emerald Insight	The growing concerns about global climate change have thrust green banking and green finance into the forefront of discussions. The research suggests that green banking plays a pivotal role in advancing environmental

sustainability in banks	sustainability. This study focuses on examining the profound impact of green banking practices on the environmental performance of banks, with a specific focus on both private and public sector banks operating in India through a survey involving 500 bank employees the study employed partial least squares structural equation modelling (PLS-SEM). The findings highlight various aspects of green banking, encompassing employee-related practices, operational procedures, customer engagement, and policy adherence, and significantly contribute to the promotion of green finance, resulting in substantial positive effects.

The results of the literature review indicate that the concept of green finance in Indonesia still largely adopts regulations that have been implemented in several other countries. However, the authorities in charge of finance have begun to develop policies and regulations that are driving banks in Indonesia to start implementing green finance in their regular lending activities. The in-depth discussion of the literature will be divided into three major objectives: first, the concept of Green Financing and how it can support Indonesia in achieving Net Zero Emissions, as seen through regulations from various countries. Second, the implementation of Green Financing from a legal perspective in Indonesia. Third, the role of state-owned banks/*Badan Usaha Milik Negara* (BUMN) in Indonesia in the implementation of green financing in the country.

3.1 Green financing implementation in several nations

3.1.1 Europe

The green finance in Europe are policy report, with very few academic studies available. A European Commission report in 2017 indicates that common green financing strategies implemented in Europe include green bonds issued according to green bond principles, green loans provided by banks involved in green loan issuance, and green equity investments. In Austria, according to Breitenfellner, a sustainability researcher, an analysis of the green finance market in Austria predicts that annual investments in Austria's green economy will grow by approximately 17 Billion Euros between 2021 and 2030. They argue that public funding alone will not be sufficient, and private capital must be mobilized to finance sustainable (or environmentally friendly) projects. They further contend that green finance will be a major breakthrough in achieving this goal. However, they acknowledge several weaknesses within Austria's financial system and note that the Austrian market for sustainable financial products is less developed than international standards.

In the Netherlands, the 2020 Pathways report documents that green funds allow individuals to invest in funds specifically directed toward qualifying environmental projects such as renewable energy, wildlife conservation, and organic farmland. At least 70% of the fund volume must be invested in eligible green projects. In Russia, highlights the need for Russian authorities to implement appropriate conditions and incentives to encourage financial institutions and private investors to participate in green financing (Damianova 2018). Several challenges to the development of green finance in Russia are identified, including the absence of a leading public sector institution to coordinate all stakeholders towards green financing, the limited number of planned green projects due to low carbon reduction targets, undeveloped green procurement, weak enforcement of environmental regulations and sectoral targets, and the lack of a regulatory framework for greening.

3.1.2 Africa

There is limited research on green finance in Africa. Among policymakers, South Africa is the only African country with a formal national strategy for green finance. In December 2017, Nigeria became the first African country and the fourth in the world to issue sovereign green bonds. The 'Green Climate Fund' was the largest multilateral climate fund active in Sub-Saharan Africa in 2019, followed by the Least Developed Countries Fund and the Clean Technology Fund managed by the World Bank.

In the African region, Morocco and Nigeria have developed national plans for sustainable green finance. In South Africa, the Johannesburg Stock Exchange created a dedicated green segment on the stock exchange. Kenya launched green bond guidelines in collaboration between the capital market authority and the Nairobi Securities Exchange. Seychelles and Namibia have each announced the issuance of blue and green bonds, respectively. Mauritius and Gabon have developed national roadmaps for launching green bonds. Central Africa has begun to develop green capital markets.

3.1.3 North and South America

CBI (2017) indicates that the rise of the green bond market in Brazil and Mexico has helped increase cross-regional trade. UNEP (2019) documented that Argentina issued three green bond deals between 2017 and 2018: two green bonds from sub-national institutions and one green bond from a financial institution. According United Nations Economic Commission for Latin America and the Caribbean documented the development of the green bond market in Latin America and the Caribbean. The United Nations Economic Commission for Latin America and the Caribbean in 2017 shows report shows that the region issued 8.4 billion dollars in bonds in both local and international markets between 2014 and 2017 (as of August 31, 2017). Most of the green bonds in the region, valued at US$7.1 billion, were issued in international markets. On average, green bonds represented only 1.6% of total bond issuances in Latin America and the Caribbean in international markets during this period. In the first half of 2017, green bonds accounted for 3.7% of total international debt issuances in the region.

Similarly, Ketterer in 2019 highlighted the need to ensure that local ‘green’ definitions and standards align with internationally accepted guidelines to avoid confusion and reputational risks in the Latin American and Caribbean regions. They suggested providing more information to improve international investors' understanding of the bond market's performance in general and the performance of green bonds in Latin America and the Caribbean. In Mexico, Lovells (2019) documented that Mexico’s first green bond was issued in 2015 to fund a wind power generation project. In 2016, the Mexico City became the first local government in Latin America to issue local green bonds to finance climate-resilient infrastructure. The second local green bond was issued in 2017 for 80 million dollars to fund the construction of the Metrobus Line 7 corridor, including terminal construction. The third local green bond in Mexico City was issued in 2018 for US$57 million to fund 27 projects related to energy efficiency, Metrobus maintenance, and upgrades to drinking water and wastewater infrastructure in certain communities of Mexico City.

3.1.4 Asia

Green finance in Asia has been rapidly evolving in response to the increasing demand for sustainable economic growth, environmental protection, and the transition towards a low-carbon economy. The region has seen significant developments in various financial instruments aimed at supporting environmentally friendly projects, such as green bonds, green loans, and sustainable investment funds. In Asia, significant developments in green finance have been observed, as highlighted by Tolliver in 2021, indicating that green financing in the region has increased to meet the growing demand for sustainable economic development. Countries like Japan, China, and South Korea have seen significant growth in

green bond issuance. China has become a global leader in green bond issuance since 2015, while the issuance of green bonds by major financial institutions and development banks in Japan and South Korea continues to expand. However, Escalante in 2020 found a lack of diversity in the green bond market participation in China. In Hong Kong, Hong Kong Green Finance Association documented several developments in green finance across various regions in Asia. Hong Kong Green Finance Association reported the formation of cross-institutional steering groups aimed at accelerating the growth of green and sustainable finance, as well as supporting government climate strategies. A self-assessment framework has also been established, allowing for the measurement of each institution's "baseline greenness."

Additionally, a comprehensive database platform has been created to provide investors with information on sustainable (and green) investment options in the Hong Kong securities market. Meanwhile, in mainland China, Hong Kong Green Finance Association reported on the Shanghai-Singapore financial cooperation and virtual events in China's green bond market. Acknowledged that green investments are difficult to implement in Asia due to various reasons (Volz, 2018). These challenges include: difficult investment conditions; an unfavorable regulatory and legal environment; inconsistent policies; complex licensing procedures; lack of awareness of environmental and climate risks; insufficient training for staff responsible for assessing environmental and climate risks in the financial industry; shortage of experienced staff in green lending; lack of bankable and investable projects; absence of mandatory environmental risk analysis; and insufficient environmental, social, and governance (ESG) disclosure requirements. Some researchers proposed several solutions to enhance green finance in Asia such as good gorvenance and regulation, good practice manipulation and good whistleblowing system (Volz 2018). These solutions include: raising awareness of environmental and climate risks in the financial sector; developing the financial industry's capacity for environmental risk analysis and management through knowledge development and sharing; building the capacity within the financial industry to develop green lending instruments; enhancing transparency through ESG disclosure requirements; providing incentives for financing green projects; supporting the development of new market segments such as the green bond market or climate risk insurance; and developing long-term local currency refinancing sources for banks to enable them to offer long-term credit.

3.1.5 South Korea

As one of the advanced economies in Asia, South Korea has been implementing green policies on a full scale since 2009 in pursuit of green economic development. The implementation of green policies, including green finance, essentially focuses on reducing carbon emissions within the country. The green policies issued by South Korea include providing incentives and offering green financing to industrial sectors. A more detailed explanation of South Korea's green policies is outlined in Table 2 as follows:

Table 2. Types of green policies in South Korea in the ASEAN development bank working paper

Num	Types of Activities	Form of Activities
1	Green Management Company Finance Support System (enVinance)	Green financing from commercial banks by providing special treatment in the form of incentives to companies that have good environmental management practices.
2	Environmental Information Disclosure	Requiring certain companies to disclose information regarding the environmental impact of their business operations.
3	Loans from the State-Owned Environmental Fund	Provision of special loans from the government-owned Special Environmental Fund to industrial sectors engaged in environmental activities.
4	Financial Support from the Government for Renewables	Provision of financial assistance from the government to producers manufacturing environmentally friendly equipment,

		companies utilizing environmentally friendly energy, and households using environmentally friendly energy.
5	Emission Trading Scheme	The implementation of cap and trade to limit the amount of carbon produced and the enforcement of carbon offsite credits.

(Oh et al., 2018)

Based on the data collected, the implementation of green policies and the provision of incentives and green financing, which have been in place since 2009, have significantly increased the production of renewable energy in South Korea. Further details are illustrated in Figure 1 as follows:

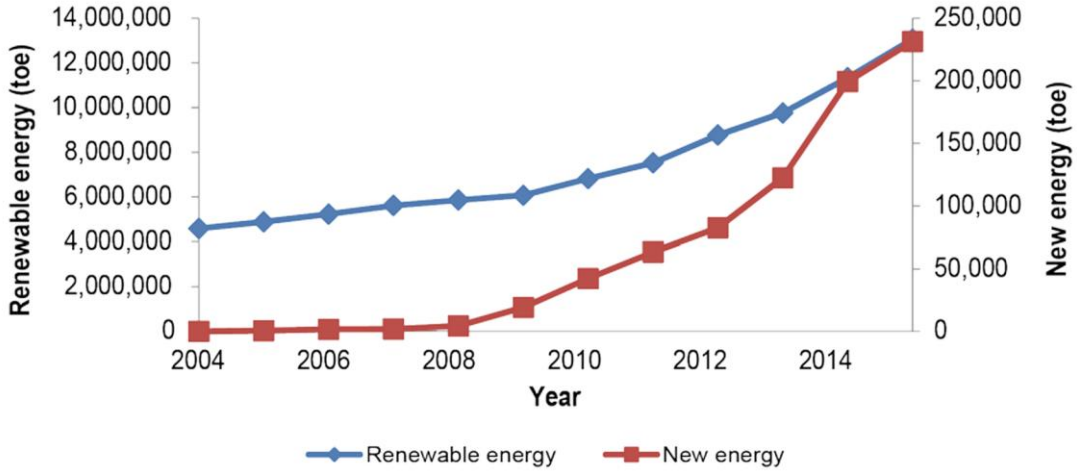

Fig. 1. Renewable energy production in South Korea from 2004 to 2016
(Oh et al., 2018)

In Figure 1, a significant increase is observed from 2009 to 2016, indicating a substantial rise in renewable energy production following the implementation of green policies in South Korea in 2009. The adoption of green policies in South Korea has been considered effective in boosting renewable energy production (RE), with the assumption that the implementation of green finance has encouraged businesses to improve their environmental management practices in order to qualify for government incentives. The shift in energy consumption patterns by businesses, by utilizing renewable energy sources, strongly indicates that the green policy implementation contributes to reducing carbon emissions associated with fossil fuel use. Moreover, the incentives provided by the government to companies with excellent environmental performance can motivate businesses to enhance their environmental management practices through more eco-friendly and low-carbon operational activities.

From 2004 to 2016, South Korea witnessed a remarkable transformation in its renewable energy landscape, characterized by a substantial increase in solar and wind energy production. Notably, the country became one of the leading adopters of solar photovoltaic technology, driven by government incentives, feed-in tariffs, and a growing public awareness of environmental issues. The implementation of the "Renewable Energy 3020" plan, which aimed to achieve 20% of total energy from renewables by 2030, marked a pivotal moment in the nation's energy policy. During this period, South Korea also made strides in offshore wind energy development, positioning itself as a potential leader in this emerging sector. However, the growth trajectory was not without challenges, including regulatory complexities, public opposition to certain projects, and the need for advancements in energy storage technologies to manage the intermittent nature of renewable sources. In conclusion, the period from 2004 to 2016 laid a strong foundation for South Korea's renewable energy future, highlighting the importance of supportive policies, technological innovation, and public engagement in achieving sustainable energy goals,

while also emphasizing the need to address existing barriers to fully realize the potential of renewable energy.

3.1.6 Singapore

As one of the developed countries in Southeast Asia, Singapore has also implemented green policies (green policy) as part of its commitment to achieving global net-zero emissions and promoting green development within the country. The implementation of green policies and green finance in Singapore focuses on three main areas: the integration of Environmental, Social, and Governance (ESG) factors, research and development of ESG-based products, and the expansion of green finance distribution in the Southeast Asian region (Chang, 2019). A more detailed explanation of the green policies in Singapore is provided in Table 3 as follows:

Table 3. Types of green policies in Singapore in the ASEAN development bank working paper

Num	Types of Activities	Form of Activities
1	ESG Integration	Integrating Environmental, Social, and Governance (ESG) factors into financial institutions, requiring companies listed on the stock exchange to report their ESG performance rigorously.
2	Research and Development in ESG Related Sector	Conducting research and development in sectors directly related to ESG (Environmental, Social, and Governance).
3	Strengthening and Expanding Green Financing Distribution in Southeast Asia	The expansion of green financing in Southeast Asia, through the provision of incentives in the form of lower interest rates compared to conventional financing.

(Chang, 2019)

The implementation of green policies in Singapore focuses on policies related to the economy and green financing. The policies applied in Singapore include the integration of ESG (Environmental, Social, and Governance), ESG research, and the expansion of green financing distribution across Southeast Asia. The implementation of regulations regarding ESG integration is one of the ways the Singaporean government ensures that all companies listed on the stock exchange report and improve their ESG performance in accordance with the applicable regulations. This is part of the government's commitment to environmental sustainability by requiring companies to produce ESG reports or sustainability reports and enhance their sustainability performance.

Research and development in sectors related to ESG is a way for the Singaporean government to encourage businesses to innovate in environmentally friendly industries in order to receive special incentives from the government. This policy is intended to help businesses increase their production capacity while minimizing the emissions generated by their operations. The policy of strengthening and expanding green financing distribution is implemented by the Singaporean government to raise awareness of the importance of sustainability among companies and other countries in Southeast Asia. This policy is carried out by offering incentives in the form of lower interest rates (soft loans) to debtors who demonstrate good environmental management capabilities. The goal of this policy is to enable both companies and debtor countries to improve their environmental management practices.

3.1.7 The potential for the implementation of green financing in Indonesia

Based on the data collected, it can be explained that the implementation of green policies in the form of well-executed green financing has significantly reduced carbon emissions in South Korea. As such, Indonesia has the same opportunity as South Korea to reduce carbon emissions through the implementation of inclusive green financing, by conducting benchmarking with countries that have already adopted green financing

practices, such as South Korea and Singapore. The form of green financing implementation in Indonesia is outlined in Table 4 as follows:

Table 4. The potential of green financing implementation in Indonesia

Num	Types of Activities	Form of Activities	Benchmarking Results
1	Green Loan	Providing financing with lower interest rates compared to conventional financing for companies that have good environmental management practices.	South Korea
2	Green Bonds	Expanding the distribution of existing green bonds to finance specific programs that have a direct environmental impact.	Singapore
3	Forming State-Owned Environmental Fund	The establishment of a special fund by the government to finance specific industrial sectors and sectors that are inaccessible to the banking sector (unbankable sectors, such as certain Small Medium Enterprises, etc.).	South Korea
4	Financial Assistance for the Environmentally Friendly Industry Sector	Provision of financial assistance from the government in the form of soft loans or grants to producers and consumers involved in the production or use of environmentally friendly technologies or projects.	South Korea

Indonesia possesses significant potential for the implementation of green financing, driven by its ambitious climate targets and the need for substantial investments to reduce greenhouse gas emissions. The establishment of a regulatory framework by the Financial Services Authority (OJK) and the emergence of green bonds, including sovereign Sukuk, signal a commitment to sustainable financing mechanisms. Opportunities abound in sectors such as renewable energy, nature-based solutions, and electric mobility, which can attract both domestic and international investments. However, challenges such as funding gaps, regulatory barriers, and the need for capacity building within financial institutions must be addressed to fully realize this potential. In conclusion, by effectively leveraging its natural resources and fostering a conducive environment for green investments, Indonesia can not only meet its climate goals but also emerge as a leader in sustainable finance, contributing to global efforts in combating climate change.

3.1.8 Implementation of green financing and its impact on carbon emission reduction

Based on data obtained through a scoping review technique, information was gathered on the impact of green financing implementation on reducing carbon emissions in various countries around the world that have implemented green financing inclusively and extensively. The data gathered shows that countries with well-implemented green financing strategies are seeing measurable reductions in carbon emissions, proving the effectiveness of these policies in advancing environmental sustainability goals, as outlined in Table 5 below:

Table 5. Impact green financing on carbon emission reduction

Num	Researcher	Nation	Bencmarking
1	(Guo et al., 2022)	China	Based on empirical studies using data from the Yangtze River Economic Belt in China, green financing has a significantly negative impact on carbon emissions.
2	(Zhou et al., 2020)	China	Green financing in China has a negative impact on carbon emissions, indicating that green financing investments in China are conducive to/supportive of the country's carbon mitigation process.

3	(Tran, 2022)	Vietnam	Green financing in Vietnam has a negative impact on carbon emissions in Vietnam.
4	(Oh et al., 2018)	South Korea	Green financing has a negative impact on carbon emissions by encouraging companies and industrial actors to transition to environmentally friendly technologies.

Based on the results of the scoping review, it was found that the implementation of green financing has a negative impact on carbon emissions in South Korea by encouraging industry players to switch to more environmentally friendly technologies. Additionally, as shown in Table 5, green financing is not only implemented in developed countries but also in several developing countries such as China and Vietnam, which have issued green policies in the form of green financing. According to empirical studies conducted (Guo et al., 2022), the implementation of green financing has a significant negative impact on carbon emissions in China. Meanwhile, research conducted by (Zhou et al., 2020) shows that green financing can improve environmental quality in the form of a significant reduction in carbon emissions. Furthermore, (Tran, 2022) found a negative relationship between green financing and carbon emissions in Vietnam.

Based on these studies, it is evident that the implementation of green financing has a negative impact on carbon emissions in China and Vietnam. The findings from various countries suggest that the implementation of green financing plays a significant role in reducing carbon emissions in developing countries like China and Vietnam. The implementation of green financing, which offers incentives such as lower interest rates compared to conventional financing, will encourage companies, businesses, and communities to shift to environmentally friendly products/activities in order to benefit from the incentives and inclusive financing.

The significant reduction in carbon emissions resulting from the implementation of green financing in other countries provides a strong signal and opportunity for Indonesia to reduce its carbon emissions. Moreover, the Indonesian government can achieve optimal carbon emission reductions by fostering synergy between financial regulatory institutions such as Bank Indonesia and the Financial Services Authority (OJK) in implementing the previously developed Sustainable Finance Roadmap, while benchmarking against countries that have successfully implemented green financing, such as South Korea and Singapore.

3.2 Legal aspect of green finance in indonesia

The legal aspects of Green Finance in Indonesia encompass the regulatory framework and legal instruments that govern sustainable finance practices aimed at supporting environmental protection, climate change mitigation, and the transition to a low-carbon economy. Key points related to the legal aspects of green finance in Indonesia include: (1) Regulations and policies. Provisions and policies implemented by Bank Indonesia and the Financial Services Authority/*Otoritas Jasa Keuangan* (OJK) regulate green finance practices, including guidelines on the issuance of green bonds, environmental risk management, and green lending criteria. (2) Legal framework. The analysis of the green finance legal framework in Indonesia involves examining the relevant laws, regulations, and policies, as well as evaluating the implementation of these legal instruments in sustainable finance practices. (3). Financial risks. The legal aspects of green finance also cover the handling of financial risks associated with climate change, environmental damage, and energy transition. Financial risks such as transition risk, physical risk, and environmental liability risk must be considered within the green finance legal framework. (4) Green financial instruments. Research also highlights various green financial instruments established under Indonesian law and regulations, such as green finance guidelines and frameworks, as well as affirmative steps to support green finance. By understanding the legal aspects of green finance in Indonesia, stakeholders can develop sustainable finance practices, support environmental protection, and accelerate the transition to a more environmentally friendly economy.

Bank Indonesia and the Financial Services Authority in Indonesia utilize various regulatory tools to influence lending, lending policies, and investment choices in the green finance sector. These regulatory tools aim to promote sustainable finance practices and support the transition to a low-carbon economy. Some of the key regulatory instruments used by Bank Indonesia and the Financial Services Authority include: Regulation No. 23/2/PBI/2021 on the Third Amendment to Bank Indonesia Regulation No. 20/8/PBI/2018: This regulation focuses on the Loan to Value Ratio for Property Loans, Finance to Value Ratio for Property Financing, and Down Payments for Property Financing and Motor Vehicle Financing. Regulation No. 20/3/PBI/2018: This provision relates to the Minimum Reserve Requirement in Rupiah and Foreign Currency for Conventional Commercial Banks, Sharia Commercial Banks, and Sharia Business Units. Regulation No. 18/POJK.03/2016: This Financial Services Authority (OJK) regulation governs the implementation of Risk Management for Commercial Banks. Regulation No. 37/POJK.03/2019: This regulation focuses on Transparency and the Publication of Bank Reports by the Financial Services Authority/*Otoritas Jasa Keuangan* (OJK). Regulation No. 11/POJK.03/2016: This regulation covers the Obligation of Minimum Capital Provision for Commercial Banks. OJK Circular Letter No. 9/SEOJK.03/2020: This circular provides additional guidelines regarding financial regulations. Indonesia Green Taxonomy Edition 1.0 - 2022: This taxonomy outlines the criteria for green investments and aims to guide investors toward environmentally friendly projects.

By implementing these regulatory tools, Bank Indonesia and the Financial Services Authority/*Otoritas Jasa Keuangan* (OJK) can shape the behavior of financial institutions, investors, and borrowers towards environmentally friendly financial practices. These regulations help create a conducive environment for sustainable investments, promote green lending, and encourage responsible financial decision-making regarding the environment in Indonesia. According to (Nursahla et al., 2023), green finance practices in Indonesia encompass the application of sustainable financial practices that support environmental protection, climate change mitigation, and the transition to a low-carbon economy. Some key environmental finance practices in Indonesia include: environmentally Friendly Banking Initiatives: Encouraging banks to apply environmentally friendly practices in their operations, lending policies, and investment decisions. This can include promoting green loans, financing renewable energy projects, and incorporating environmental risk management into banking operations. Issuance of Green Bonds: Facilitating the issuance of green bonds to fund environmentally friendly projects such as renewable energy infrastructure, energy efficiency initiatives, and climate adaptation measures. Green bonds help channel investments towards eco-friendly projects and support the development of the green bond market. Environmental Finance Guidelines and Frameworks: Developing guidelines and frameworks for financial institutions to encourage green finance mechanisms. The central bank can play a role in creating non-mandatory guidelines for issuing green bonds, environmental risk management practices, and green loan criteria to guide financial institutions toward sustainable practices. Green Taxonomy: Establishing a green taxonomy that classifies economic activities based on their environmental impact and contribution to sustainability. The green taxonomy helps investors identify eco-friendly investment opportunities and supports the development of green financial products. Soft Power Initiatives: Implementing affirmative actions to encourage investment preferences for environmentally friendly finance. This may include participation in international forums such as the G20 Summit to promote sustainable financial instruments and align with global efforts to address climate change. By practicing green finance in Indonesia through these initiatives and frameworks, financial institutions, regulators, and policymakers can contribute to sustainable development, environmental protection, and the transition to a more eco-friendly economy.

4. Conclusions

The benchmarking results from countries that have successfully implemented green finance, such as South Korea and Singapore, suggest that the types of green finance policies that could be adopted in Indonesia include green loans, green bond issuance, the creation of a State-Owned Environmental Fund, and financial assistance for industries with strong environmental management practices. Additionally, studies in several countries indicate that green finance significantly contributes to reducing carbon emissions. The implementation of green finance encourages companies, entrepreneurs, and communities to transition to more environmentally friendly products and activities in exchange for incentives. This paper presents a literature review on green finance research and identifies several areas for future study. The findings show that green finance has the potential to make a significant impact on the environment and society, but there are challenges such as a lack of awareness, inconsistent definitions, poor policy coordination, inconsistent policies, and insufficient incentives for investors and financial institutions.

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