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Visualizing green finance and green growth relationships with power bi tools

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This article provides an overview of the concept of green finance and its role in promoting sustainable economic growth, with a particular focus on the top 15 countries with the highest GDP and green growth index from 2010 to 2019. The article discusses the negative impact of energy consumption on the environment and highlights the need for a shift towards a low-carbon, resource-efficient, and socially inclusive economy. Data from 186 countries were collected from the World Bank and the OECD's iLibrary for the years 2010 to 2019, and the analysis method involved descriptive statistical analysis and simple linear regression analysis using the DAX function language in Power BI. The research findings reveal that CO2 emissions and economic financial indicators are interrelated, and using Power BI tool visualizing green finance data shows the correlation between GDP and CO2 emissions and highlights the countries that have achieved high levels of green finance. The article concludes by suggesting several solutions to promote green finance on a global scale, including establishing funding sources that prioritize green finance projects, creating green investment opportunities, and improving legal regulations to support the development of green finance.

Keywords: green growth, green finance, CO2, environmental sustainability

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1 Introduction

Climate change has brought about major challenges to global sustainability, with energy consumption being a significant factor contributing to climate change (Irfan and Ahmad, 2022). Recent studies conducted by Iqbal et al., 2021 have shown that all forms of energy consumption, including renewable energy, have a negative impact on the air, water, and land environments. The industrialization process has resulted in the use of fossil fuels for daily activities, commercial production, and transportation, as well as emissions from vehicles and waste generated by industrial areas. These activities are the primary causes of environmental degradation and pose a general threat to humanity. The impact of pollution not only harms human health but also exacerbates the depletion of resources and aggravate exacerbates the increase in natural disasters due to rapid climate change.

Therefore, it can be seen that the development of the economy is closely linked to environmental protection, which is not only a challenge but also a common goal of mankind to transform the types and methods of energy use, reduce the environmental pollution such as carbon emissions and optimize the allocation of industrial structures. The use of the "green" term related to economic development is an action to draw attention to the importance and necessity of protecting natural environmental elements in the economy. The concept of a green economy means directing towards an economic model based on sustainable production, exchange, consumption, balance and sharing of social economic benefits, especially concern for nature and the environment. The term 'green growth' refers to the process of enhancing the potential of green activities and sectors, which can serve as a driving force for economic growth. Building climate resilience through low-carbon development, which involves consuming less fossil fuels and emitting fewer greenhouse gases, is crucial.

A green economy is defined as low-carbon, resource-efficient and socially inclusive. Job growth and income in a green economy are driven by investments in economic activities, infrastructure, and assets. These investments focus on reducing carbon emissions and pollution, improving resource and energy efficiency, and preventing the loss of biodiversity and ecosystem services. One of the drivers to develop the economy is the financial sector, even countries with limited financial resources can balance the efficiency of creating a platform and resources leading to innovation in the financial sector, thereby stimulating economic growth (Furuoka, 2015). Green finance refers to financial support for green growth. On one hand, green finance contributes to the shift towards environmentally friendly behavior, the development of renewable energy or the recycling of used goods. On the other hand, green finance avoids the expansion of any business activities or actions that may harm the natural environment.

2 Theoretical background and literature review

Green investment

The term "green growth" refers to the process of fostering sustainable economic growth while also enhancing environmental quality, reducing pollution, and employing renew-

able resources. Green growth is seen as a comprehensive approach to the economy and the environment, rather than just focusing on economic growth without regard for environmental issues and vice versa. Green growth includes many aspects, such as enhancing resource productivity, enhancing labor productivity, developing renewable energy, improving energy efficiency, developing green products, and recycling materials. The goal of green growth is to ensure sustainable economic growth and social development while protecting the environment and resources for future generations. Green growth is a cutting-edge strategy that is viewed as a response to the issues surrounding the global economy's sustainable development.

The theory of green investment encompasses both theoretical and applied aspects, exploring the role of green investments as a mechanism for global sustainable development. It places emphasis on understanding the impact of global environmental challenges on international competitiveness and economic policies (Yin, 2019). Green investments aim to safeguard ecosystems and protect the environment, making them a vital component of sustainable economic development. These investments involve various financial instruments that minimize negative environmental impacts, with both public and private finance playing a crucial role in their implementation (Tsaregradskaya, 2022). The promotion of a green economy and sustainability is closely intertwined with the development of financial and investment instruments (Mikryukov et al., 2021). In the realm of coal resource capitalization, green capitalization development encompasses principles such as conservation, environmental protection, harmonious coexistence, and sustainable development (Zhu and Zhu, 2020).

Several studies have explored the concept of green investment by considering environmental, social, and governance (ESG) criteria. Heinkel et al. (2001) and Barnea et al. (2005) highlight the potential of green investment to influence corporate behavior, with Heinkel suggesting that it can drive polluting firms towards greater social responsibility. Eyraud et al. (2013) further supports this notion, finding that green investment is positively impacted by policy interventions like carbon pricing schemes. Pástor et al. (2021) adds to the discussion by suggesting that although green assets may have lower expected returns, they outperform when positive shocks impact the ESG factor, indicating the potential for long-term growth in this area.

To gain a clearer understanding of the benefits of green investment, visualizing the data can be particularly helpful, allowing for easier interpretation and analysis. Various visualization methods, such as charts, graphs, and infographics, can be utilized to present and highlight the advantages of green investment in a visually compelling manner.

Green growth and Green Finance

Green economic growth, driven by green innovation, has a complex impact on green financial development. According to Aguilera-Caracuel and Ortiz-de Mandojana (2013), green innovation is positively associated with firm profitability, but its effects are also influenced by national institutional conditions. In the banking sector, Akomea-Frimpong et al. (2022) states that green finance products such as green securities, investments, and credit are influenced by environmental and climate change policies, interest rates, and

banking regulations.

Studies have highlighted the significant role of green finance and digital finance in sustainable growth and environmental protection. Zhang (2023) demonstrates that these financial approaches contribute to the reduction of CO2 emissions. Wang et al. (2023) find that green financial policies and reforms improve environmental quality and reduce air pollution, leading to sustainable development. Salsabila et al. (2022) emphasize the importance of green banking activities in minimizing the environmental impact of banking operations and contributing to environmental protection and management efforts.

Green growth performance has also been linked to positive economic development, particularly in terms of resource efficiency and sustainability (Ferreira et al., 2023). Xu and Dong (2023) assert that green finance, through green investment, enhances the rationalization and advanced level of industrial structures, ultimately driving high-quality economic development.

In conclusion, green economic growth has a profound impact on green financial development, as supported by various scholars in the field. It's evident that green innovation, supportive policies and regulations, green finance products, and the implementation of green banking activities all play crucial roles in fostering sustainable economic growth and environmental improvement.

In short, Green growth means promoting economic growth and development while taking care not to alter the natural capital, the resources on which our future depends. Green growth aims to respect biodiversity, natural resources and working conditions. The green economy also means limiting greenhouse gas emissions by removing fossil fuels from our consumption.

Green finance refers to financial activities that promote environmentally sustainable economic growth and development, while also reducing carbon emissions and other negative environmental impacts. The goal of green finance is to shift investment flows toward activities that are consistent with a low carbon, resource efficient, and environmentally sustainable economy. Green finance includes a wide range of financial instruments and activities, such as green bonds, green loans, green insurance, and other financial products and services designed to support sustainable investments. Green finance also involves the incorporation of environmental, social, and governance (ESG) considerations into investment decisions. Overall, green finance plays an important role in supporting the transition to a more sustainable and resilient economy by financing projects that contribute to environmental sustainability and address climate change.

Green finance refers to increasing the flow of finance (from banks, microcredit, insurance, and investments) from the public, private, and non-profit sectors towards sustainable development priorities. It is expected that green financing will improve environmental and sustainability concerns by financing. Green finance and carbon trading methods are the starting point for achieving "carbon-neutral" policies, which can allocate resources and leverage financial resources to tilt toward low carbon green projects (Zhang, 2021).

Previous research has emphasized the three channels that can exist between financial development and environmental degradation. Green economic development and growth require the participation of many stakeholders, including the government, large con-

sumers, individuals, businesses, producers, investors, and financial lenders. Specifically, the impact of financial development on environmental degradation can be analyzed as follows:

First, financial development can impact environmental degradation through economic growth. Governments often attract FDI and ODA sources to promote economic growth. However, when this growth leads to higher energy consumption due to investments in industrial and commercial production, it results in environmental degradation (Shahbaz et al., 2018).

The second point is that as the financial market develops, consumers will have easier access to more credit. As the economy grows, the income of citizens also increases, leading to greater purchasing power and demand for products that consume a lot of energy. This increased consumption of energy-intensive products leads to greater pollution (Agbloyor et al., 2016).

The third point is that financial development increases investment attraction, leading to higher energy consumption and production. Extensive research has consistently demonstrated the adverse impacts of heavy reliance on non-renewable resources on financial development (Bjerkholt and Niculescu, 2004). This relationship becomes especially salient in the context of power production, as economic growth spurs energy demand, consequently intensifying the consumption of non-renewable resources (Khan et al., 2021). Subsequently, this leads to environmental degradation, which further exacerbates the situation by necessitating additional financial resources to mitigate the consequences. Moreover, studies have found that resource-rich countries, with increased revenue from natural resources, tend to exhibit lower taxation efforts in other revenue categories, which may be attributed to weaker institutions (Alun and Treviño, 2014). Hence, it is critical for nations to embrace energy source diversification and invest in renewable energy to safeguard the environment and foster financial development.

The research article employs a range of variables to explore the relationship between CO2 emissions and economic financial indicators. These variables include the measurement of CO2 emissions per capita, which considers the use of fossil fuels and the production of cement. This measurement encompasses all carbon dioxide emissions resulting from the consumption of solid, liquid, and gas fuels, as well as gas flaring.

Additionally, the study examines the percentage of domestic credit extended to the private sector as a percentage of GDP. This indicator provides insight into the financial resources made available to private enterprises by financial institutions, including loans, non-equity securities, and trade credits, as well as other accounts receivable. In some countries, these claims may also extend to public enterprises. The financial institutions involved in extending credit include monetary authorities, deposit money banks, and other financial corporations where data are available, including those that do not accept transferable deposits but incur liabilities such as time and savings deposits. These variables are critical in analyzing the relationship between economic growth and CO2 emissions.

Foreign direct investment, expressed as a percentage of GDP, represents the amount of investment that a foreign entity makes in acquiring a significant management interest (at least 10 % of voting stock) in an enterprise operating in a country other than

the investor's home country. This investment includes equity capital, reinvestment of earnings, other long-term capital, and short-term capital as reported in the balance of payments. This percentage reflects the net inflow of foreign investment (new investment inflows minus disinvestment) in the host economy and is calculated by dividing it by the host country's GDP. Essentially, this indicator provides insight into the level of foreign investment in a country and its significance to the host country's economy.

Net official development assistance (% of GNI) refers to the disbursement of funds that meet the official development assistance (ODA) definition established by the Development Assistance Committee (DAC) and are provided to countries and territories on the DAC's aid recipients list. This indicator provides insight into the level of financial support that countries receive from the international community to promote their economic and social development.

CO2 emissions from air transport per capita are measured through a database that includes information on CO2 emissions from commercial passenger, freight, and general aviation flights for 186 countries, both on a territory and a residence basis. The OECD estimates these emissions using a consistent methodology across countries, including annual, quarterly, and monthly data. This indicator sheds light on the carbon footprint of the aviation industry and its contribution to global CO2 emissions.

Energy productivity is calculated as GDP per unit of TES (USD/toe) and reflects, to some extent, efforts to enhance energy efficiency and reduce carbon and other atmospheric emissions. This indicator, along with energy intensity, also accounts for structural and climatic factors that affect energy use. By examining energy productivity, we can gain insight into a country's ability to create economic value while minimizing its energy consumption and environmental impact.

3 Data sources and research methodology

Data was collected from 186 (out of 208) countries around the world, from the websites of the World Bank and the OECD's iLibrary. The data variables were obtained for the years 2010 to 2019. Data from 22 countries was excluded due to missing values. The data includes various measures of environmental degradation and financial development, as well as a comprehensive set of variables that can be used to visualize and analyze the data. Environmental degradation is measured using three indicators: CO2 emissions, CO2 emissions in the aviation sector, and production-based CO2 emissions (including CO2 emissions from air transport per capita and production-based CO2 emissions). Financial development is measured by domestic credit to the private sector, domestic credit to the private sector by banks, foreign direct investment, net official development assistance provided, and % GNI. Other control variables include GDP and energy production.

This article explores the practical applications of data analysis tools in modern green finance and economic analysis. The analysis method involves using DAX formulas in Power BI to perform descriptive statistical analysis of key indicators, such as maximum value, minimum value, average value, and standard deviation, as well as conducting

simple linear regression analysis. The data is analyzed using the newly designed table that includes variables and DAX formulas for calculating the sum of CO2 emission data, foreign direct investment data, and GDP data. Moreover, the table provides DAX formulas for calculating the amount of CO2 emission per unit of GDP and the amount of GDP per unit of CO2 emission, which are important measures for analyzing green finance and green growth.

The results of our data analysis are then visualized using the Power BI tool, emphasizing the importance of data analysis tools in modern green finance and economic analysis. The values in our statistical table are calculated using the DAX language in Power BI from the 'World-Bank' dataset, and we use these values to create charts that display the results of our data analysis. Through our analysis, we demonstrate the practical benefits of using data analytics tools to analyze and display green financial data.

4 Research results

Based on the summary statistics, it can be inferred that the average worldwide consumption of fuel for production is 913874.87 USD, with an average CO2 emission of 4.2 kilotons. The average CO2 emissions generated by commercial passenger flights, goods, and commercial aviation, both domestically and internationally, are 28075.72 tons. Moreover, the average CO2 emissions resulting from production activities are 18773.4 tons. Further analysis of the trend in high CO2-emitting countries during the period from 2010 to 2019 includes nations such as Qatar, Kuwait, Bahrain, United Arab Emirates, Luxembourg, Australia, Brunei Darussalam, Saudi Arabia, Oman, and Kazakhstan are among the 15 countries with the highest CO2 emissions per capita. These countries rely heavily on natural gas and oil to fuel their economies, leading to significant carbon emissions. Canada has high CO2 emissions due to its significant use of coal-based energy sources, particularly in the development of coal-fired power plants, and the use of fossil fuels in daily human activities. The country also has a complex transportation system, including rail and urban transportation, and some industrial plants that contribute to high CO2 emissions. The transportation and oil and gas sectors are the two largest sources of CO2 emissions in Canada, accounting for approximately 50 % of the country's total emissions.

The United States emits CO2 from several sources, including transportation, electricity production, industry, commercial buildings, and agriculture. The country's dependence on fossil fuels has contributed to its high carbon emissions.

In the past, the United Kingdom produced its steel, which resulted in significant CO2 emissions during the production process. However, the country has since shifted its focus to cleaner and more sustainable forms of production, leading to a reduction in its carbon emissions. Broadly speaking, there are 15 countries that have high levels of CO2 emissions, and tend to be marked by robust economic growth, numerous manufacturing facilities, and a high number of transportation options. These nations are

Table 1: Descriptive statistical results of variables

Variable	Mean	Median	Std.Dev
GDP	432,786,063,045	35,413,418,615	1,704,723,706,694
Population	3,133,878.485	444,366.5	13,112,823.2
Energy productivity, GDP per unit of TPES	913,874.8723	905,433.5	528,770.953
CO2 emissions from air transport per capita	28,075.71754	3,731.5	84,351.74996
Production-based CO2 emissions	18,773.40131	1,980	80,815.92419
Renewable energy public RD&D budget, % total energy public RD&D	2,186.743295	1,953	1,511.44864
Domestic credit to private sector	54.34375083	43.05652216	43.43674316
Domestic credit to private sector by banks	51.40919237	42.41707387	40.67927392
Net ODA provided, % GNI	29.40240964	18	29.41177742
Foreign direct investment	5.60124104	2.89730665	14.4515781
CO2 emissions	4.252745618	2.546493672	5.13520575
Energy public RD&D budget, % GDP	3.863117871	3	2.800676202

Source: Own research

heavily dependent on fossil fuels, such as coal and oil, to power their factories and other business operations, as evidenced by the study's findings. Additionally, these countries have a significant demand for energy, coupled with a lack of stringent environmental regulations, resulting in an overall poor record of environmental protection.

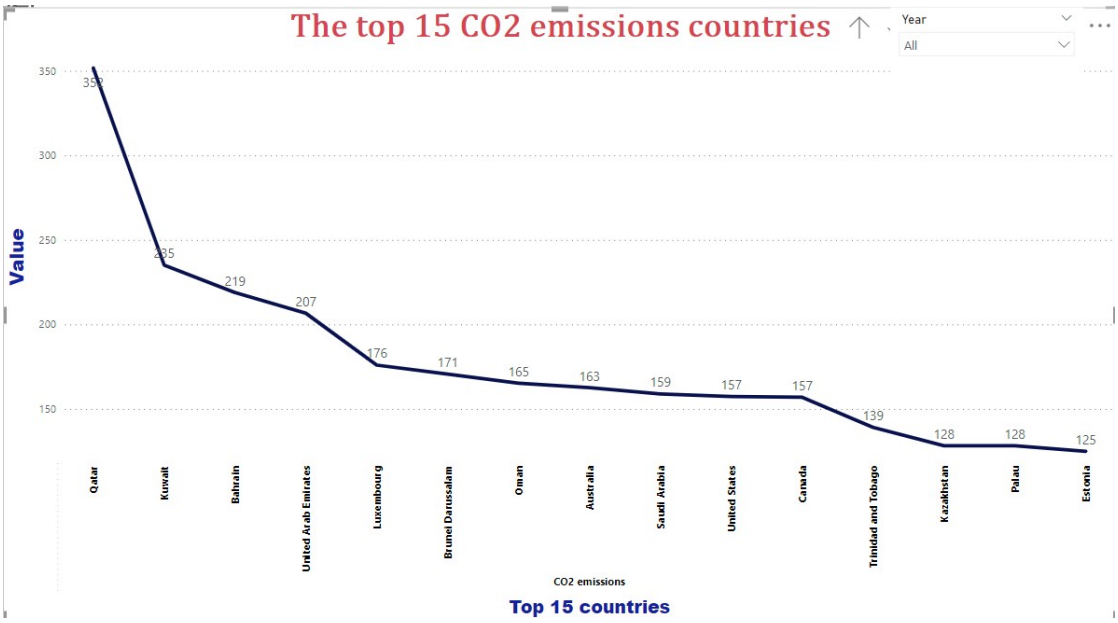

Figure 1: Top 15 countries with high CO2 emissions in the period 2010-2019

Source: Own research

Furthermore, the data visualization of the top 15 countries with high GDP reveals that these nations share several common characteristics, including robust economic development, high rates of economic growth, and efficient resource and energy utilization. Studies have shown that countries with high GDP tend to have numerous businesses and manufacturing facilities, particularly modern and high-tech manufacturing plants. Additionally, these nations typically have well-established financial and social security systems, which provide their citizens with a high level of financial stability and trust.

If we define GG as the green growth index (GG = GDP/CO2), then countries aim to achieve a high GG by generating a high GDP with minimal CO2 emissions. The carbon finance metric is calculated by the ratio of carbon dioxide emissions to GDP. As a result, the chart presented below displays that 15 countries have currently reached high levels of GG growth, meaning they have achieved significant economic growth while emitting comparatively low levels of CO2.

On the other hand, if the goal is to minimize CO2 emissions per unit of GDP, it is known as green finance. The results of data analysis and visualization yield a list of the top 15 countries with the highest green finance index, indicating that these countries have been successful in reducing their carbon emissions while maintaining economic growth.

The green growth model allows countries to explore possibilities for achieving low-

Figure 2: Top 15 countries with high GDP generation during the 2010-2019 period

Source: Own research

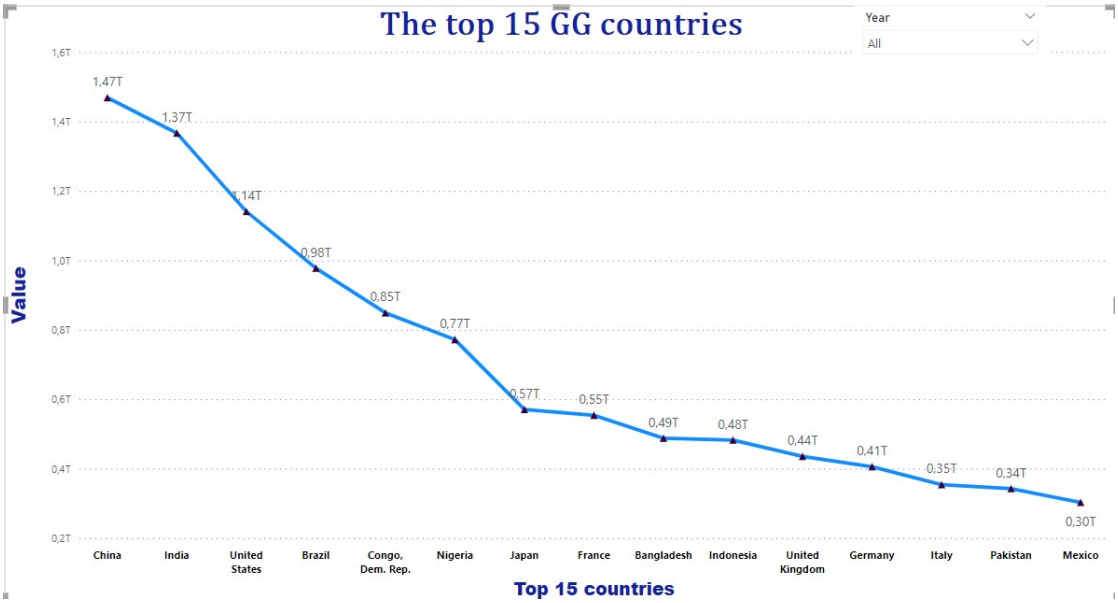

Figure 3: Top 15 countries with high green growth index period 2010-2019

Source: Own research

Figure 4: Map chart top 15 countries with high green growth period 2010-2019

Source: Own research

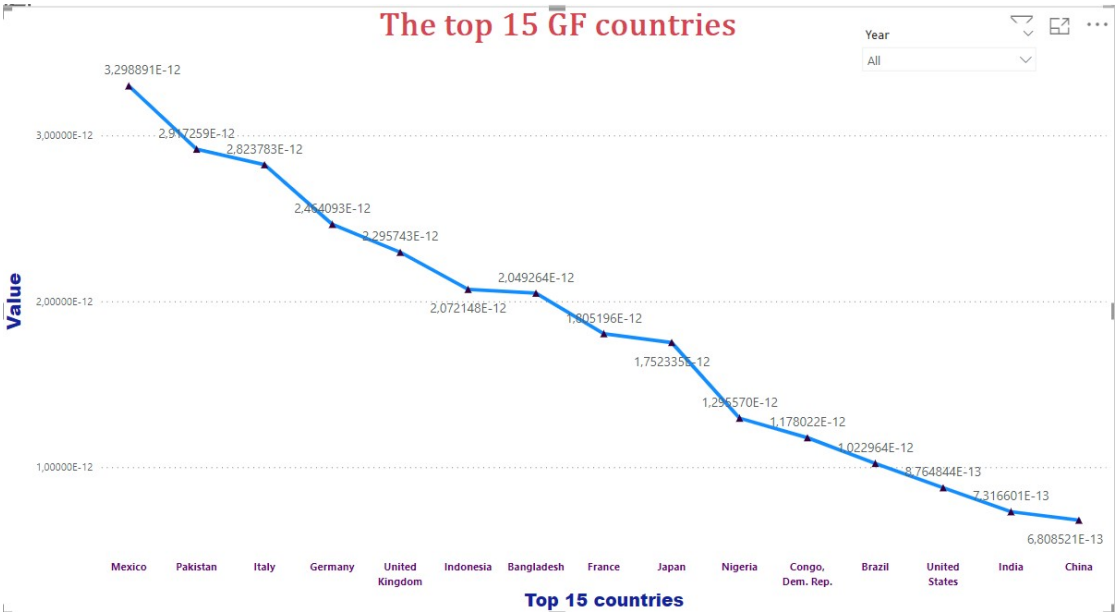

Figure 5: The top 15 countries with high green finance index during the period 2010-2019

Source: Own research

carbon economic growth while also adapting to climate change, preventing or mitigating pollution, preserving a healthy ecosystem, creating green jobs, reducing poverty, and promoting social inclusion. The simple regression analysis conducted on green growth

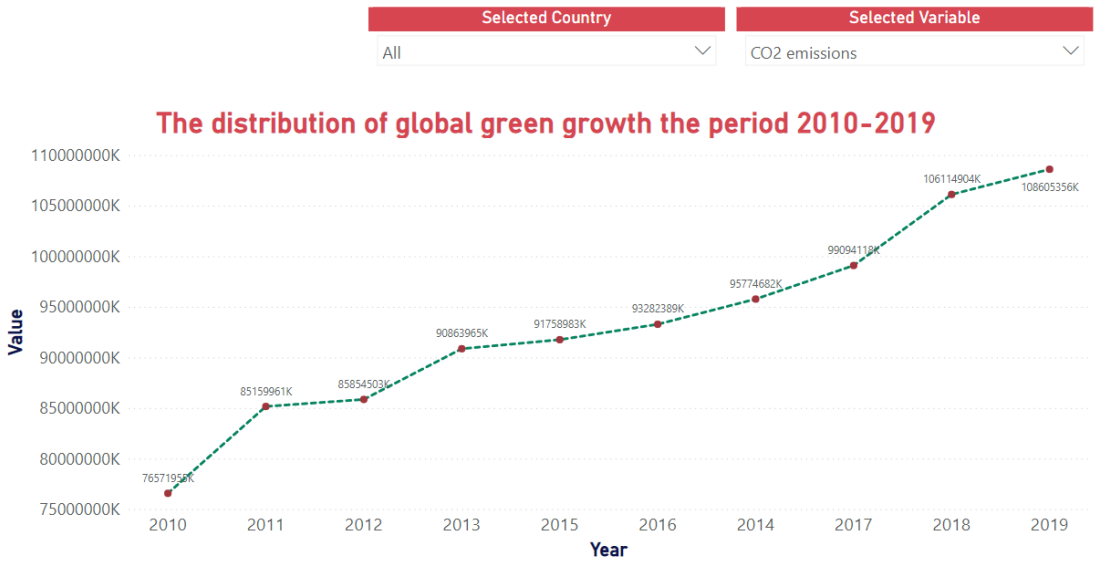

Figure 6: Distribution of Green Growth Index in the 2010-2019 period

Source: Own research

from 2010 to 2019 revealed that companies investing in the green finance sector have consistently achieved robust growth over the past decade. The growth of green finance infrastructure was further supported by policies and regulations implemented by various countries. Moreover, the increasing demand for green finance products from customers has also incentivized businesses to invest in this area. During the period of 2010 to 2019, the global financial situation was stable and experienced strong growth, providing an ideal environment for the development of green finance. However, this field still faces numerous challenges, including incomplete policies and regulations, inadequacies in risk assessment, and the need for further advancements in green finance solutions.

5 Discussion

Green finance is a novel and innovative financial approach that holds great significance in addressing social and environmental issues. It emerged from a focus on sustainable growth with the aim of minimizing negative impacts on the environment and society.

To ensure the success of green finance, research and evaluations are essential to determine the effectiveness of green finance solutions and to identify necessary improvements. Long-term development strategies for green finance are also necessary to guarantee sustainable growth in the future. In conclusion, the worldwide development of green finance

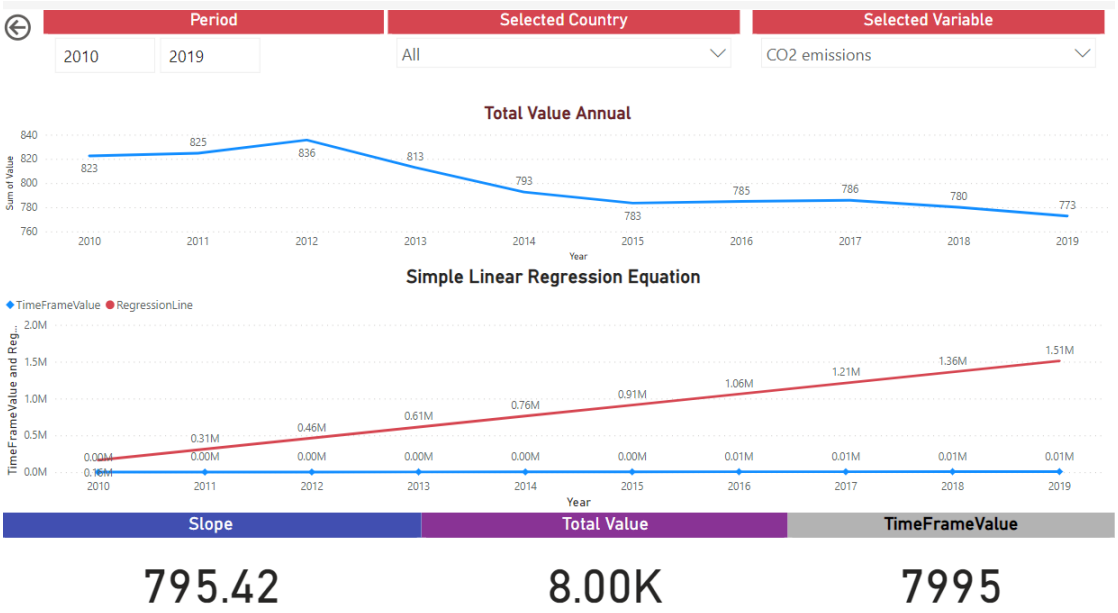

Figure 7: Simple Linear Regression Equation green growth period of 2010-2019

Source: Own research

must be supported by governments, financial organizations, investors, and communities. By implementing specific solutions, green finance can become a critical tool in resolving environmental and social problems and to support sustainable development for the world in the future.

Additionally, assessing the effectiveness of green finance projects is also a crucial issue that needs to be addressed. Clear standards and criteria are required to evaluate which projects meet the requirements of green finance and provide value for the environment and society.

Lastly, green finance is a progressive and crucial way to tackle current social and environmental issues. However, to effectively implement green finance, challenges must be addressed, and investments must meet green finance standards.

6 Conclusion

Both the concepts of "green finance" and "green growth" can be seen as the same goal, which is to ensure sustainable economic growth and to protect the environment. However, green finance is often seen as a mechanism to achieve the goal of green growth. If a country wants to achieve green growth, developing green finance is necessary. Green finance will support green growth projects and ensure that they are carried out using sustainable resources and have minimal impact on the environment.

To achieve sustainable economic growth while protecting the environment, it is cru-

cial to develop green finance. This involves promoting investments that prioritize environmentally friendly projects and integrating sustainable practices in financial decision making. Simultaneously, advancing green growth can also contribute to the development of green finance. As such, it is essential to develop both concepts in tandem.

There are several solutions that can be implemented to promote green finance on a global scale. One approach is to issue green finance certificates, which can provide investors with information about which projects meet green finance standards and are environmentally and socially beneficial. Another important strategy is to establish funding sources that prioritize green finance projects, thereby providing sustainable investments and financing access for green initiatives. These measures can accelerate the transition towards a more sustainable future.

Moreover, encouraging investor participation in green finance is crucial, and this can be achieved by supporting green finance projects and creating green investment opportunities. Creating favorable conditions for the development of green finance is also necessary, including improving legal regulations and providing financial support. To evaluate the effectiveness of green finance solutions, research and evaluations are needed to determine their success level and identify areas for improvement. Additionally, long-term strategies for green finance development are necessary to ensure its sustainable growth.

Overall, promoting the development of green finance globally requires collaborative efforts from governments, financial organizations, investors, and the community. By implementing practical solutions and raising awareness of the benefits of green finance, we can create a more sustainable and prosperous future for everyone.

References

Agbloyor, E. K., Gyeke-Dako, A., Kuipo, R., and Abor, J. Y. (2016). Foreign direct investment and economic growth in ssa: The role of institutions. *Thunderbird International Business Review*, 58(5):479–497.

Aguilera-Caracuel, J. and Ortiz-de Mandojana, N. (2013). Green innovation and financial performance: An institutional approach. *Organization & Environment*, 26(4):365–385.

Akomea-Frimpong, I., Adeabah, D., Ofosu, D., and Tenakwah, E. J. (2022). A review of studies on green finance of banks, research gaps and future directions. *Journal of Sustainable Finance & Investment*, 12(4):1241–1264.

Alun, T. and Treviño, J. P. (2014). Resource dependence and fiscal effort in sub-saharan africa. Technical report, IMF Working Paper WP/13/188, Washington DC. www. imf. org/external/pubs/ft ....

Barnea, A., Heinkel, R., and Kraus, A. (2005). Green investors and corporate investment. *Structural Change and Economic Dynamics*, 16(3):332–346.

Bjerkholt, O. and Niculescu, I. (2004). Fiscal rules for economies with nonrenewable resources: Norway and venezuela. In *Rules-Based Fiscal Policy in Emerging Markets: Background, Analysis, and Prospects*, pages 164–179. Springer.

Eyraud, L., Clements, B., and Wane, A. (2013). Green investment: Trends and determinants. *Energy Policy*, 60:852–865.

Ferreira, J. J., Lopes, J. M., Gomes, S., and Dias, C. (2023). Diverging or converging to a green world? impact of green growth measures on countries' economic performance. *Environment, Development and Sustainability*, pages 1–19.

Furuoka, F. (2015). Financial development and energy consumption: Evidence from a heterogeneous panel of asian countries. *Renewable and Sustainable Energy Reviews*, 52:430–444.

Heinkel, R., Kraus, A., and Zechner, J. (2001). The effect of green investment on corporate behavior. *Journal of financial and quantitative analysis*, 36(4):431–449.

Iqbal, N., Abbasi, K. R., Shinwari, R., Guangcai, W., Ahmad, M., and Tang, K. (2021). Does exports diversification and environmental innovation achieve carbon neutrality target of oecd economies? *Journal of Environmental Management*, 291:112648.

Irfan, M. and Ahmad, M. (2022). Modeling consumers' information acquisition and 5g technology utilization: Is personality relevant? *Personality and Individual Differences*, 188:111450.

Khan, I., Han, L., Khan, H., and Kim Oanh, L. T. (2021). Analyzing renewable and nonrenewable energy sources for environmental quality: dynamic investigation in developing countries. *Mathematical Problems in Engineering*, 2021:1–12.

Mikryukov, A., Chilimova, T., and Serebrennikova, A. (2021). Investments in green economy as a driving force for sustainable economic development. In *E3S Web of Conferences*, volume 296, page 06037. EDP Sciences.

Pástor, L., Stambaugh, R. F., and Taylor, L. A. (2021). Sustainable investing in equilibrium. *Journal of Financial Economics*, 142(2):550–571.

Salsabila, A., Fasa, M. I., Suharto, S., and Fachri, A. (2022). Trends in green banking as productive financing in realizing sustainable development. *Az-Zarqa': Jurnal Hukum Bisnis Islam*, 14(2):151–174.

Shahbaz, M., Nasir, M. A., and Roubaud, D. (2018). Environmental degradation in france: the effects of fdi, financial development, and energy innovations. *Energy Economics*, 74:843–857.

Tsaregradskaya, I. K. (2022). "green" investments in the context of sustainable development: features of legal regulation. *Courier of Kutafin Moscow State Law University (MSAL))*, (8):116–123.

Wang, M.-X., Huang, L., and Chen, Z.-M. (2023). The impact of green financial policy on the regional economic development level and aqi—evidence from zhejiang province, china. *Sustainability*, 15(5):4068.

Xu, S. and Dong, H. (2023). Green finance, industrial structure upgrading, and high-quality economic development–intermediation model based on the regulatory role of environmental regulation. *International Journal of Environmental Research and Public Health*, 20(2):1420.

Yin, W. (2019). Integrating sustainable development goals into the belt and road initia-

tive: would it be a new model for green and sustainable investment? *Sustainability*, 11(24):6991.

Zhang, Y. (2023). Impact of green finance and environmental protection on green economic recovery in south asian economies: mediating role of fintech. *Economic Change and Restructuring*, 56(3):2069–2086.

Zhang, Z. (2021). China and the world under the goal of carbon peak and carbon neutrality—green and low-carbon transition, green finance, carbon market and carbon border adjustment mechanism. In *People's Forum Acad. Front*, volume 8, pages 1–11.

Zhu, X. and Zhu, L. (2020). Construction of green theoretical framework of coal resource capitalization. *International Journal of Clean Coal and Energy*, 9(2):15–25.

Appendix A

Table 2: DAX formulas for Measure

Measure	The Measure or Variable Meaning	DAX formulas
CO2	Calculate the sum of CO2 emission data	CO2 = CALCULATE(SUM('World-Bank'[Value]),'World-Bank'[VAR]="CO2")
FDI	Calculate the sum of Foreign direct investment data	FDI = CALCULATE(SUM('World-Bank'[Value]),'World-Bank'[Variable]="Foreign direct investment")
GDP	Calculate the sum of GDP data	GDP = CALCULATE(SUM('World-Bank'[Value]),'World-Bank'[Variable]="GDP")
Green Finance	Calculate the amount of CO2 emission per unit of GDP	GF = DIVIDE([CO2],[GDP],0)
Green Growth	Calculate the amount of GDP per unit of CO2 emission	GG = DIVIDE([GDP],[CO2],0)

Table 3: DAX formulas for Measure

Measure	The Measure or Variable Meaning	DAX formulas

Regression	Simple linear regression to predict for each country based on the time series data from the 'World Bank' table using the linear regression line	`RegressionLine =`
		`var data = FILTER(`
		`SELECTCOLUMNS(ALLSELECTED('World-Bank'),`
		`"x_values",'World-Bank'[Year],`
		`"y_values",[TimeFrameValue]`
		`),`
		`AND(`
		`NOT(ISBLANK([x_values])),`
		`NOT(ISBLANK([y_values]))`
		`)`
		`)`
		`var y_sum = SUMX(data,[y_values])`
		`var x_sum = SUMX(data,[x_values])`
		`var x2 = SUMX(data,[x_values]^2)`
		`var xy = SUMX(data,`
		`[x_values]*[y_values])`
		`var row_count = COUNTROWS(data)`
		`var Intercept = (y_sum * x2 -`
		`x_sum * xy) / (row_count * x2 -`
		`(x_sum)^2)`
		`var Slope = (row_count * xy -`
		`x_sum * y_sum) / (row_count * x2`
		`- (x_sum)^2)`
		`var Regression =`
		`SUMX('World-Bank', Slope *`
		`'World-Bank'[Year] + Intercept)`
		`return Regression`