

CHAPTER 2

LITERATURE REVIEW

2.1 Literature Review

Climate change has become a serious issue in the world nowadays. Research by Zademach & Dichtl stated that the energy sector is responsible for two-thirds of carbon emission producers. This research focuses on the financial sector's shift from traditional business methods to greener and modern business methods due to the realization of the value of renewable energy potential in the energy sector, especially the coal mining sector (Zademach & Dichtl, 2016). Zademach & Dichtl's research also found the difference in financing sustainable transition between Germany and Poland. Whereas Germany focused on the transition into post-nuclear and post-fossil energy supply, Poland chose to invest in nuclear as their energy source.

In Germany, the change in the financial sector is being supported by the citizens. This can be seen from the change in behavior of the institutional and retail investor concern towards the renewable energy sector, which is increasing (Zademach & Dichtl, 2016). However, there is also a risk of the investor getting insecure about the prospect which leads to their retreat, such as a change in regulation that may affect the business. Therefore, strong regulation, a clear legal framework, and policy objectives are needed to ensure the safety of the investors and financial institutions, not only the firms themselves. Since, in this research, the financial sector contribution is not as big and as consistent as the contribution by the retail and big investors (Zademach & Dichtl, 2016).

There are concerns about the effect of finance policy reform and either finance policy reform could foster investment in non-green industries to become more greener. In China, the green finance reform policy was established and known as the Green Finance Reform and Innovation Pilot Zone in 2017 to

create an ecological civilization, and this pilot area has a different status and inherent benefits such as technological level, etc (Lv & Zhou, 2023). Lv and Zhou's research was conducted using the DID model to analyze the impact of the policy, with the data gathered from 2011 to 2020. This paper stated that the Green Finance Reform and Innovation Pilot Zone was able to increase the green investment by the private firms due to the reputational cost and loan scale variable. Reputational cost means a bad reputation for the firm because the carbon emitted or non-green operational process will impact the stakeholder opinion, which will impact the firm valuation, and the low valuation will have an impact on the market performance. Other than reputational cost, there are also loan scale variables that will enable firms to have bigger loans for their green investment project, thus it will stimulate the firm to invest in greener projects and engage more in green economics (Lv & Zhou, 2023).

Lv and Zhou's research also mentions about the importance of monitoring mechanisms to ensure the correct evaluation of both the protection and benefits of the environment including social factors. The monitoring mechanism will prevent, or reduce, the risk of misuse of green investment, either due to fake or false environmental reports, or the wrong method of obtaining the green investment. Last but not least, Lv and Zhou also highlight the importance of the person in charge, or in the research, the term used was the enterprise manager. Since the long-term performance and decision within the firm depends on the person in charge. Therefore, the person in charge needs to be visionary and aware of the environment. So they can enhance and integrate sustainable development within the company culture, policy, and strategy (Lv & Zhou, 2023).

In the current situation of Indonesia's private companies, most of the companies have already made environmental or sustainability reports to show what has been conducted by the company. Research by Rahim examines the disclosure effect of sustainable reports on economic, environmental, and social

performance and mentions increasing stakeholder awareness toward a sustainable and green future. Thus, it managed to move the mining company to create a sustainability report that included information about environmental, economic, and social aspects (Rahim et al., 2024). The environmental aspect shows the process of the company in reducing its carbon footprint and the process of transitioning into greener business practices, the social aspect highlights the quality of the surrounding community, and the economic aspect highlights the growth of the company. Rahim stated that openly disclosing information about the company's actions towards the environment, society, and economics may improve their reputation. This research data was gathered from the investment gallery database of Universitas Muslim Indonesia, and the company report and the company chosen listed on the Indonesia Stock Exchange from 2018 to 2022 before being analyzed using multiple linear regression and checked with a normality test, multicollinearity test, heteroscedasticity test, and auto-correlation test to ensure the data met the classical assumption (Rahim et al., 2024).

The result of this research found that there are significant effects of sustainability reports towards the return of assets, within the economic aspect, due to the transparency that increases the investor and stakeholder confidence level, and also increases the company's financial performance in the long run. The sustainability report affects the company's return on equity ratio. This also the effect of transparency, which made the investor and other stakeholders hold their share even if there is diminishing return due to investment made in green projects, while also motivating the company to increase their profit at the same time. This means by abiding by the rules and regulations and participating in making a greener future, the company will gain the loyalty of the customer, implying an increase in the return on sales ratio (Rahim et al., 2024). On the effect of environmental aspects within the sustainable report. The research by Rahim found that there are no significant towards the company's return of

assets, and return of sales ratio. While there is a significant effect on the company's return on equity ratio. The reason why there is no significant effect of the environmental aspect toward the return of assets ratio was the additional occurrences to the company when they increase the disclosure on the environment aspect. Even though, Rahim argues, that in the long run, it will bring benefits due to the reputation of the firm and the stakeholder preferences (Rahim et al., 2024). As for the return on sales ratio, the disclosure of such information is not deemed as important compared to developed countries. Implying that investors did respond more compared to the economic performances.

While the significant effect on the return on equity ratio was due to the increase of confidence of the investors and other stakeholders in providing more funding for the green projects, and holding their share when there are diminishing returns in the short-term. Meanwhile, the social aspect of the sustainability report done by the company does have a significant effect on the return on assets and return on sales ratio. This was due to the transparency that enabled the stakeholders to know the information and created harmonious relations. For the return on equity ratio, Rahim stated that it has no relation to financial performance, thus it has no significant relation to sustainability development. From the research done by Rahim, it can be concluded that there is an increase in stakeholder awareness and company incentives to invest in greener projects while increasing the transparency of the information at the same time (Rahim et al., 2024).

To explore the difficulties faced by the Indonesian government in attaining low carbon development goals, the researcher thinks that we need to know the condition of Indonesia first. Setiawan mentions that Indonesia is the 8th greenhouse gas emitter, with the fossil fuel energy sector as the largest carbon emission producer. While the energy sector is the backbone of the nation's economic growth, especially in developing countries, Indonesia's

energy sector growth has managed to surpass the economic growth. The other concern mentioned by Setiawan, which is implicitly due to the coal mining industry because the supporting factor of carbon emitted is the dependence on Indonesia's fossil fuel energy due to the necessity to fulfill the growing electricity demand (Setiawan et al., 2021). Indonesia is dependent on coal as the energy source to fulfill the electricity demand since coal energy or coal-based power plants have significantly lower costs compared to renewable energy power plants. Need to mention also that the effort to transition to renewable energy, to combat climate change has been made even if it still mostly relies on government funding. Setiawan has mentioned several possible methods such as green lending, social lending, green investment, green loans, etc. However, there are several challenges that Setiawan has found in the process of making the financial institution engage in green economics and support the greenhouse gas emitter company to undergo the transition (Setiawan et al., 2021).

The challenge was the high risk in the green project due to the high risk, the return was uncertain, and the lack of awareness from the bank that resulted in the decrease of green financing, the high cost of undertaking green projects, and due to the substantial time before the investment generated a return. The other challenge was also related to the limited option of green financing, namely green credit, issued by the banks due to issue green credit because of the expensive selection process, low returns that made the banks reluctant, and there is still no standardization of the categorization of the carbon emission producer. Setiawan research has given the insight that Indonesia's green financing still relies mostly on government green incentives, without much support by banking or other financial sector due to a lack of standardization of greenhouse gas emitter, and a lack of policy to incentivize the financial sector (Setiawan et al., 2021).

Looking at the implications of sustainable development in the Chinese industrial sector, the development was due to technological advancement and green investment. China as one of the biggest energy market drivers and one of the biggest in producing carbon emissions also become one of the leading countries in combating climate change at the same time. Chen mentioned that technological advancement has increased the tendency of dynamic change within company growth (M. Chen et al., 2023). This research uses autoregressive distribution lag or ARDL. The data on this research was acquired from the World Bank and IRENA with the time span from 1996 to 2020 and through the analysis, Chen found that Green investment defines the involvement of banks in providing the investment to the green project of a carbon-intensive company and/or greener company. Chen's research found a significant relationship between the increase in research and development expenditures, technological advancement, and green investment toward industrial structures. Therefore, according to Chen, the Chinese government needs to establish a green tax to intensify and incentivize the company to undertake green projects and financial instruments in lending and investing practices (M. Chen et al., 2023).

Does pursuing a green economy help a nation eradicate its energy poverty, in the post-COVID-19 era. Since the main reasons coal fossil fuel was able to nourish itself despite the pressure from the international world was due to the increasing demand for electricity and to support economic growth, especially for developing countries. Zhao's research stated that there was originally a goal established by the UN in 2015 to address carbon emissions by the energy sector. However, if the goal is achieved, then around 670 million people worldwide could not get access to the energy, which is defined as energy poverty. Therefore this research is going to find the regional heterogeneity and mediating effect of green finance in the process of eliminating energy poverty (J. Zhao et al., 2023).

Zhao's research regarding green finance was focused on China due to the status of the world's largest energy consumer and its massive population. In China, green finance has adopted financial institutions to support the transition into greener business practices. The data used by Zhao were from China Statistical Yearbook, China Energy Statistical Yearbook, China Environmental Statistical Yearbook, and China Regional Financial Operation Report from 2004 to 2014. Zhao's research found that the transformation within the financial institution will affect the regional technical innovation and industrial structure adjustment in a positive direction which not only strengthens it but also accelerates the process. However, the effect was greater in technological innovation compared to industry transformation, and Green finance has been proven, by Zhao's research, to be able to accelerate green recovery and green economy in post post-COVID-19 era (J. Zhao et al., 2023). The effect of eradicating green poverty only works in low-energy poverty areas, not in the high ones, which only works in the eastern part of China. For the central and western parts, Zhao recommended investing in the infrastructure and institution system of financial institutions to support eradicating energy poverty and Zhao also stated that the government should do more than create policies and systems and advocate such as providing green incentives to support the enterprises (J. Zhao et al., 2023).

There are other important institutional impacts in the process of achieving a green future, according to Chen, institution plays a significant role in reducing global carbon emissions since the outward foreign direct investment might just move the carbon emitter firm somewhere else with lower environmental regulations for the company's growth. Staying with high regulations standards not only forces the company forced to comply and conduct their activity according to the regulations, but it also increases their cost and hinders their growth, especially when it comes to the need to invest in modern green technology and other green projects which tackled by China by

launching a green incentive called green insurance (Q. Chen et al., 2022). According to Chen, green insurance's purpose is to protect the people from environmental risk and, incentives polluting firms to do the transition by sharing their risk. The regulation regarding fines and punishment on environmental issues is very strict in China.

Therefore green insurance is needed to transfer and divide some risk with the third parties for any failure in the process of transition. Chen's research uses data from Chinese listed firms, the official local government website, the environmental protection agency, and the accounting research database, from 2008 to 2014 (Q. Chen et al., 2022). The result of the research confirms the effect of green insurance in reducing the outward foreign direct investment by the firm. Chen's research also found that a high degree of marketization level region has a significant reduction in the outwards foreign direct investment compared to the low degree of marketization level regions, due to green investment. However, green investment only manages to significantly reduce the outward foreign direct investment in non-Belt Road Initiatives countries while it was considered weak, by the research, on the Belt Road Initiatives countries. This research concludes that green investment could reduce the company's motivation to invest in low-regulation countries, implying a reduction in global carbon emissions (Q. Chen et al., 2022).

As mentioned above, the energy sector still relies on coal due to the dependency on fossil fuels such as coal due to the demand in various sectors. One of the sectors that was major energy consumption was the tourism sector, especially in developing countries. This research explores the chain effect of the other sector on the energy sector. Zhu wants to find the effect of green finance on inbound tourism with the study case in 30 Chinese provinces with the data from a China-related statistical yearbook, China Research Data Services Platform, and China Stock Market Accounting Research ranging from 2010 to 2021, excluding Tibet, Hong Kong, Macau, and Taiwan. The data have

then been analyzed using the two-way fixed effects model (Zhu et al., 2024). The result of Zhu's research was there is a significant positive effect of green finance on inbound tourism and mediating the usage of renewable energy and technology innovation. However, there is also an insight that the tourism sector that was incentivized was located in the eastern and western parts only indicating that the tourism sector in low and high-energy poverty areas could be an incentive to invest in green projects when there is support from financial institutions. Therefore, there are justifications that involving and utilizing financial institutions, instead of over-reliance on government subsidies, able to motivate not just the energy sector, but also other sectors that are energy consummators such as the tourism industry (Zhu et al., 2024).

According to Hieu, a sustainable environment brings benefits equally between the environment and economy if being cultivated by both profit and non-profit organizations. The concept of a sustainable environment tries to utilize green incentives done by both government and other institutions such as green investment and green tax to reduce the environmental impact done by companies and change their long-term plan, especially in heavily polluting industries such as the coal mining industry (Hieu, 2022). Hieu's research tries to find the effect of green investment and green tax, including population and economic growth, on the effort to reduce carbon emissions through a sustainable environment in ASEAN with the data from OECD, WDI, and other secondary data from 1981 to 2020. Hieu's research found that there are negative linkage between green investment and green tax towards carbon emission. The reason was the green investment done by the company in the transition into greener practices was effective in reducing the total carbon emission while the reason the green tax is effective in reducing carbon emissions is because of the possible upcoming penalty that motivates companies to restrain and re-design their project to do as little harm as possible to the environment (Hieu, 2022). Hieu research also found that the growth in economy and population indeed

contributes to the increase of carbon emissions and has a negative linkage with a sustainable environment. Therefore, in the growing economic and population countries, the willingness of the company to invest in green projects, that have been influenced by the policy and environmental/ green tax regulations, could reduce the carbon emitted (Hieu, 2022).

In pursuing sustainable development, green investment is necessary to help industries to transition into greener practices which come either from the investment on renewable energy, technological innovation, waste management, etc. Barabanov's research tries to find the determinants factor of green investment with the data that was gathered from Reuters ESG, the company's annual report (consisting of market capitalization, the market value on equity, return of assets, return to total assets ratio and debt to assets ratio), the government website, and the World Bank database. Barabanov's research found that larger firms tend to do green investments more than smaller firms. However, if the firms were more profitable and highly valued, they tend to make smaller green investments (Barabanov et al., 2021). The higher the country's GDP per capita and population also incentivize firms to conduct green investment activity. However, within the countries that are motivated to increase their GDP growth, with normal populations, the firms tend to reduce their green investment and focus on more profitable investments, regardless of the environmental impact. Barabanov's research also finds a relationship between investor protection to green investment, and the reason for this phenomenon was that countries with stronger protection towards the creditor may incentivize firms to invest in short-term projects to pay the regular interest, instead of investing in long-term investments such as green investments. Therefore, Barabanov's research explains the potential effect of countries' GDP, population, and policy implications on investors in influencing firm decisions to transition into greener practices and conduct long-term green investments (Barabanov et al., 2021).

The motivation of the company to invest in green projects and conduct green transition may differ depending on the region they are in. In Russia, the company has its own motivation that incentivizes them to make green investments. Research done by Kabir and Rakov studies the identifying factors that influence companies to make green investments and determines whether it was due to government incentives or comes from the influence of stakeholders towards the company and company strategy by analyzing green stocks, bonds and loans, government subsidies and budget allocation, and government regulations, and found that the reasons for the movement from the firm could have mostly come from political factors/ government policy and regulation especially when we look at the UN agreements that try to promote a green economy as the future economy (Kabir & Rakov, 2023). Kabir and Rakov define green economy as an effort to help industrial companies transition to greener business practices, and avoid any crisis that may emerge during the process, and green investment as an investment in technological modernization and found that Russia has put a decree namely Presidential Decree No. 666 of 4 November 2020 that tries to reduce greenhouse gas emissions from the firm. The research found that taxation on extractive industries could motivate the extractive or mining industry to conduct green investments, and the same applies to firms that have an increase in carbon emitted. There are also *ceteris paribus* effects of residual value of fixed assets and investment on fixed assets. However, the increases in foreign direct investment reduce investment by firms on fixed capital. In other words, there are positive impacts of foreign direct investment on supporting the green economy (Kabir & Rakov, 2023). The tightening of environmental regulations, according to Kabir and Rakov's research, was also able to foster green investment by industrial firms even though low green investment firms, are more incentives to invest in green projects due to the fees charged to them while in high green investment firms, foreign direct investment incentives them more than the fees. Therefore, the

government agenda in establishing a green economy has more influence to incentivize companies rather than on national development issues and business strategies (Kabir & Rakov, 2023).

Countries that are heavily dependent on natural resources export, such as coal, may have a harder time motivating mining companies to invest in green projects such as renewable energy. Yan's research tries to study the relationships between green investment, fiscal policy, environmental tax, energy price, natural resource rent, and the consumption of clean energy towards sustainable development. This study was done in Cambodia (Yan et al., 2023). The result of the research found that an increase in green investment has a significant positive effect on renewable energy projects, and green investment has an immediate effect in fostering the utilization of renewable energy sources while in expanding renewable energy sources, government incentives such as tax incentives, subsidies, and grants have a lasting impact since green taxes and subsidies could alleviate some costs related to green projects, which attract the investors, companies, and other stakeholders to invest in green projects. Government incentives could also increase the adoption of renewable energy, other than due to technological innovation (Yan et al., 2023). Yan's research stated that environmental tax could increase clean energy demands, implying a decrease in dependency on fossil fuel energy sources, and the countries that heavily rely on natural resources such as coal may be having a harder time promoting and adopting renewable energy. This could cause the countries to experience lower growth if they transition into renewable energy alternatives, referred to as the 'resources curse'. Therefore, clear and systematic strategies that emphasize both economic growth and environmental protection need to be made by the government to ensure the allocation of resources in promoting and adopting clean energy doesn't sacrifice the nation's growth (Yan et al., 2023).

There is also an effect of international coal prices on the countries that heavily depend on coal to support either their energy demands or economic growth since fossil fuels such as coal have become the foundation for economic and social development. W. Zhao's research links the effect of international coal prices with renewable energy alternatives. W. Zhao found that the increase in international coal prices will increase the proportion of renewable energy, indicating the close relation between international coal prices on economic and social development. In the industrial sector, the decline of international coal prices could stimulate coal consumption due to a decrease in downstream costs in the industrial sector other than the renewable energy sector. Therefore, the development of renewable energy could drive new industrial change and stimulate economic development from different alternative energy sources (W. Zhao et al., 2021).

The research by Borghesi explores the effect of the government policy to incentivize the green transition may affect the company in different sectors' financial performances and market performances. This research analyzes the data of green policy-related announcements (GPA) and European stock market returns and found that there is a positive impact of GPA on both brown and green stock with more benefits for green stock when there is a policy announcement to fight climate change due to market perception on the brown stock market that was considered more exposed to climate change risk and risk from the policy implementation. The brown stock in the energy sector from most of the Europe has a good reaction to the GPA because of positive sentiment from the investors and the weight of policy implementation risks, and likely to accelerate the process of green transition in the middle to long term. However, the effectiveness of GPA depends on the public sentiment towards the government that indicates the importance of a credible GPA and good strategy to support a smooth transition process in the long run. Borghesi's research also stated that the incentives from the government could lead to the resource

allocation from brown stock into green investment project and make high-carbon intensive industries lose its lucrativeness due to risk in their competitiveness and rising capital issues (Borghesi et al., 2022).

Stakeholder theory is applied in this study to understand the connection between government subsidies and private coal mining businesses' green shift. According to stakeholder theory, businesses have obligations to a variety of parties, including the community at large, suppliers, consumers, employees, and shareholders. Government subsidies serve as a means of providing financial motivation to companies to conform their operations to the demands of various stakeholders, especially those who are proponents of environmental sustainability. Coal mining firms that get subsidies are incentivized to implement environmentally sustainable technology and processes. This helps them to address issues raised by stakeholders and improves their overall reputation as a company (Lv & Zhou, 2023; Rahim et al., 2024; J. Zhao et al., 2023).

This study uses institutional theory to analyse how GDP per capita affects private coal mining businesses' green transition. According to institutional theory, the legal and cultural standards, as well as the expectations of the general public, greatly influence the behaviour of organisations. The public's demand for environmental sustainability and stronger regulations tends to rise as GDP per capita rises. Richer cultures frequently place a higher priority on environmental preservation and put pressure on businesses to abide by these laws and standards. Higher GDP per capita, which is impacted by other factors, may therefore encourage coal mining businesses to embrace greener methods in order to uphold their legitimacy and satisfy institutional expectations (Yan et al., 2023; Zademach & Dichtl, 2016; W. Zhao et al., 2021).

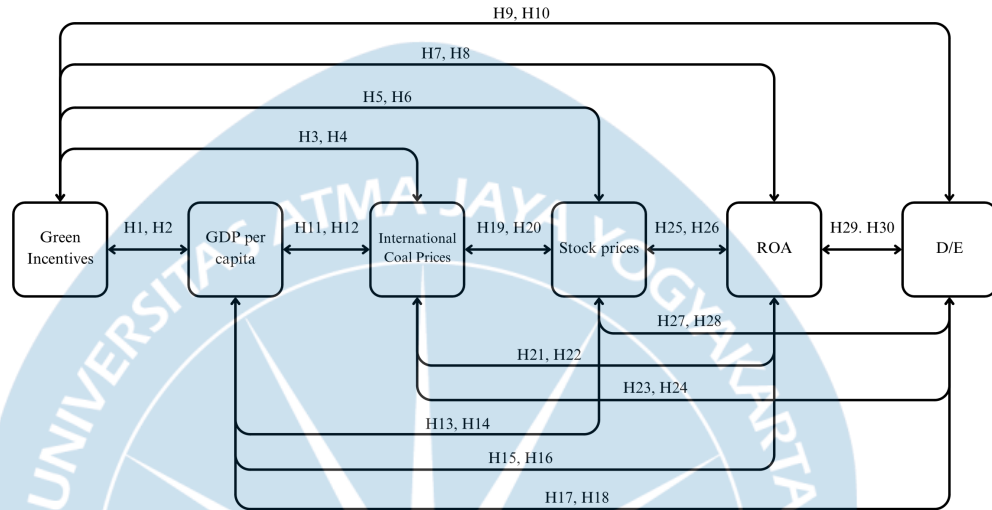
In this study, the Resource-Based View (RBV) is utilized to elucidate the influence of global coal prices on the environmentally conscious shift of private coal mining firms. The strategic resources and capabilities that

businesses have that can give them a competitive edge are the main emphasis of the RBV hypothesis. The profitability and resource availability of coal mining firms are directly impacted by fluctuations in the variable, particularly in international coal prices. Due to the immediate financial rewards, businesses may choose to maximize short-term profits over long-term investments in sustainability while coal prices are high. Lower coal prices, on the other hand, might make businesses less profitable. As a result, they may look for different ways to diversify their business and lower their risk profile, such as investing in green technology (Barabanov et al., 2021; Setiawan et al., 2021; W. Zhao et al., 2021).

Sustainable development theory offers a basic structure for examining the correlation between financial indicators like Return on Assets (ROA) and Debt-to-Equity (D/E) ratio, and the shift towards sustainable practices in private coal mining firms. This theory stresses the significance of satisfying current needs without jeopardizing future generations' ability to fulfill their own needs. Companies that have a strong financial performance, as reflected by a higher Return on Assets (ROA), are better able to allocate resources and invest in sustainable practices and green technologies. Likewise, a decreased D/E ratio indicates reduced financial leverage, providing increased flexibility and stability for making green investments. Companies can achieve long-term viability and environmental sustainability by integrating sustainable development principles into their financial strategies. Thus, Each theory offers a comprehensive framework to explain the dynamics between financial incentives, economic conditions, and corporate behavior in the context of green finance (Hieu, 2022; Kabir & Rakov, 2023; Zhu et al., 2024).

2.2 Theoretical Framework

Figure 2 Theoretical Framework



Source: Data made by the writer

In the literature review, the studies regarding the role of green financing in promoting and supporting transition in heavily polluting industries, especially the mining industry have been highlighted a lot. Other than institutional involvement, the government plays a huge role in facilitating the transition. The facilitation can be through green incentives and/or policies to support the green transition. Previous research also finds that the role of government could prevent the company from seeking and outsourcing in the low regulation nation. Thus moving the carbon-intensive activity to other nations. The theoretical framework is inspired by previous research to explore the interrelation effect of Indonesian government incentives and the situation of private coal mining companies.

The first variable is government subsidies. Yan's research argues that government subsidies have a lasting impact on the coal mining industry's transition to invest in greener projects such as renewable energy sources (Yan et al., 2023). Even though, Kabir & Rakov argue that the effectiveness of

government incentives comes in from green taxation specifically in extractive or mining industries to perform green investment and green transition (Kabir & Rakov, 2023). In the case of this research, green incentives come from energy subsidies in the government's state budget. Any form of government subsidies may alleviate the cost of related and attract business actors to invest in green projects. Therefore, the first variable to be used is Indonesia government subsidies or APBN, specifically on the energy subsidies since the focus of the energy subsidies was to increase the energy efficiency and energy transition.

The second variable is GDP per capita. GDP per capita also affects companies to conduct green investment activity. Barabanov argues that an increase in GDP per capita goes in line with firm green investment due to affordability that comes from the increase in the market size and purchasing power of the market (Barabanov et al., 2021). However, some researcher argues that an increase in GDP per capita may decrease the incentive to transition to greener business practices. Since many businesses will focus on supplying the demand on the market to get the benefits from economic growth, the government may put the policy to pursue an increase in their national budget (Hieu, 2022). Which leads to the rapid extraction of coal to supply the energy demands. Therefore, there is a need to account for Indonesia's GDP per capita as one of the variables.

The third variable is international coal price. This factor could be seen as a company transition accelerator, especially for coal mining. Some researcher argues that an increase in international coal prices might incentivize the market to shift to using renewable energy (W. Zhao et al., 2021). Change of the market preference will eventually incentivize coal mining companies to invest in green projects and renewable energy sources. Coal price fluctuation also affects the country's macroeconomy which relies on their natural resources such as Indonesia. International coal price fluctuation will have an impact on the market preferences, company, and the government to push the company in various

sectors to conduct a transition into a greener economy, especially coal mining companies. Therefore, the researcher will use the variable of International coal prices with the Newcastle Coal Futures Index as the benchmark.

It has been stated before that sustainable reports and actions have a significant effect on the big company's stock prices through the reputation of the companies. It is more important, for companies to care for their reputation, in order to maintain the lucrativeness of their company in the market. Rahim's research argues that a sustainability report is a way for companies to disclose information regarding their responsibility for the environmental damage of their operational activity (Rahim et al., 2024). However, there is also a relation that affects the company performance, especially coal mining companies, in transitioning towards renewable energy and greener business activity. Therefore, in order to see the effectiveness of the company transition. Company stock price, return on assets (ROA), and D/E ratio (Debt to Equity ratio) will be used.

The fourth variable chosen will be company stock price. Company stock price is set as the determinant factor. Even though company stock price is not affected exclusively by green incentives. Company stock price can be used to show the commitment of the company to transitioning into greener business practices. It was due to the influence of the stakeholders and shareholders. The change in market preference could affect the company's reputation, regardless of the financial performance of the company, if they didn't pursue taking responsibility and transitioning into greener business practices. which leads to the company's stock price performance (Rahim et al., 2024).

The fifth variable is the return on assets (ROA). The cost alleviation due to government incentives, market purchasing power, and international coal prices could also influence the performance of the company's ROA (Q. Chen et al., 2022; Lv & Zhou, 2023; Rahim et al., 2024; Yan et al., 2023). Signalling the existence of fluctuation in their ROA in the status QUO is a sign of their

transition activity due to the nature of risk in conducting green investment. ROA in this research will specifically be attributable to the company industries, which are coal mining industries. Therefore, ROA could indicate the company's increase in the efficiency of its operations. This could indicate the adoption of greener practices by the coal mining company.

The last variable is the debt-to-equity (D/E) ratio. The D/E ratio is determined by the availability of the funds and the market conditions. This means that the D/E ratio could explain the relationship of GDP per capita, government energy subsidies, and international coal price towards the capability of the company to conduct green investment and transition towards renewable energy and greener business practices, indicating the reduction of reliance on debt financing (Barabanov et al., 2021; Setiawan et al., 2021; Yan et al., 2023; Zademach & Dichtl, 2016). This could enable the company to have better financial conditions to invest in green projects, fund green initiatives, and utilize green financing opportunities. Therefore, the variables that will be analyzed using the Engle-Granger Causality method were Indonesia's energy subsidies, GDP per capita, and international coal price as group 1, and company market prices, ROA, and D/E ratio as group 2.

2.3 Hypothesis Development

In this section, the researcher tries to formulate the hypothesis of the expected impact from the variable discussed in the theoretical framework. This hypothesis will only focus on Indonesia's coal mining company. Each pair of variables will have two hypotheses, one for each direction of relationships. This hypothesis aims to explore the possibility of predicting the future value of the variables from the past value of the other variables. The list of hypotheses formulated from the theoretical framework is as follows:

1. Green incentives \leftrightarrow GDP per capita

It has been a mainstream strategy of developing countries to utilize low carbon economy development. Indonesia as the top ten countries that are responsible for 67% of total world carbon emissions has allocated its national budget to pursue renewable energy (Kementerian Keuangan et al., 2022). However, some of Indonesia's population are faced with the risk of energy poverty. The same budget allocated for pursuing renewable energy is also used to subsidize the energy due to the income gap and uneven regional development. Zhao's research regarding energy poverty shows that green financing methods, such as green incentives, from the government could help alleviate energy poverty and increase green economic recovery in post post-COVID-19 era (J. Zhao et al., 2023). Energy poverty could be analyzed from either GDP per capita, per capita disposable income, unemployment rate, or all of them. This research chooses GDP per capita as the variable and will explore the relation between Indonesia's energy subsidies and the government's green incentives on GDP per capita with the hypothesis as follows:

H1: Green incentives Granger cause changes in GDP per capita

H2: GDP per capita Granger cause changes in green incentives

2. Green incentives ↔ International coal prices

The government energy subsidy allocation depends on the APBN or national budget. While Indonesia's income significantly derives from its national resources, with an increase in the mining sector up to 63,17% (YoY) (Endang Larasati, 2022; Setiawan et al., 2021). Endang Larasati also mentions that Indonesia still benefited from the increase in the commodity price (Endang Larasati, 2022). Meanwhile, W. Zhao's research argues that the increase in coal price will lead to an increase in renewable energy development and energy

structure transformation (W. Zhao et al., 2021). This makes the research interested in exploring the relation of the Indonesian government's green subsidies with the international coal price. The hypothesis for this relation is as follows:

H3: Green incentives Granger cause changes in international coal prices

H4: International coal prices Granger cause changes in green incentives

3. Green incentives ↔ Stock prices

Government green incentives play a major role in incentivizing private company transition (M. Chen et al., 2023). Borghesi's research shows that increasing attention from the government could incentivize private companies to conduct green transition and adopt renewable energy (Borghesi et al., 2022). The relation of green incentives could explore the amount of attention of government put in incentivizing private companies to conduct green transition and the effectiveness of the government incentives. Green incentives could also alleviate the financial constraints of the company and enable it to invest in green projects and conduct a transition plan (Lv & Zhou, 2023). Therefore, the research would like to explore the relationship between Indonesian green incentives on the private coal mining company stock prices/market performances with the hypothesis as follows:

H5: Green incentives Granger cause changes in stock prices

H6: Stock prices Granger cause changes in green incentives

4. Green incentives ↔ ROA

Green incentives from the government can alleviate some of the financial constraints of the company (Lv & Zhou, 2023). Since there are many risks in conducting green investment and green transition

(Zademach & Dichtl, 2016). Green financing has also proven to have a relation to company return on assets (Zhu et al., 2024). For coal mining companies, they will need assistance to help diversify their risk in order to maintain the stability of the company income. Q. Chen's research stated in order to maximize return on assets, the company may choose to invest in low regulated nation instead (Q. Chen et al., 2022). Therefore, it is important to explore the effectiveness of the green incentives on the company ROA. Green incentives could also incentivize the company budget allocation (Setiawan et al., 2021). The hypothesis of this relation is as follows:

H7: Green incentives Granger cause changes in ROA

H8: ROA Granger causes changes in green incentives

5. Green incentives \leftrightarrow D/E

Companies that have a high level of debt, may be inclined to conduct green investment or green transition (Barabanov et al., 2021). However, in Indonesia, the ones that benefited are state-owned enterprises (Setiawan et al., 2021). It is important to note that D/E or the loans of the company are the backbone to support company infrastructure development. Green incentives as government financing tools are crucial for energy transition (Zademach & Dichtl, 2016). Therefore, this variable will explore the effect of the green incentives on D/E, and the effect of the company D/E on green incentives with the hypothesis as follows:

H9: Green incentives Granger cause changes in D/E

H10: D/E Granger cause changes in green incentives

6. GDP per capita \leftrightarrow International coal prices

Indonesia is a countries that heavily depend on natural resources. Changes in coal prices could affect the economy. International coal prices could have an effect on economic activity

(W. Zhao et al., 2021). Thereby affecting the GDP per capita. The increase in GDP per capita may also affect energy consumption to further increase economic growth (Hieu, 2022). Thereby affecting the international coal prices. Thus, this research would like to explore the relation between GDP per capita and international coal price with the hypothesis as follows:

H11: GDP per capita Granger causes changes in international coal prices

H12: International coal prices Granger cause changes in GDP per capita

7. GDP per capita ↔ Stock prices

Foreign investors tend to be concerned about the sustainability practices of the company (Kabir & Rakov, 2023). The increase in awareness for a green future has already made an impact on the company's market performance. Research by Zademach shows that there is a change in investor behavior in the renewable energy sector (Zademach & Dichtl, 2016). However, there is also investor behavior that seeks profit and short-term benefits instead of long-term benefits (Q. Chen et al., 2022; Setiawan et al., 2021). The number of investments made could be portrayed by the country's GDP per capita. Therefore, this research would like to explore the effect of GDP per capita and stock prices with the hypothesis as follows:

H13: GDP per capita Granger cause changes in stock prices

H14: Stock prices Granger cause changes in GDP per capita

8. GDP per capita ↔ ROA

Barabanov's research found that an increase in GDP per capita could increase the company's incentive to conduct green investments (Barabanov et al., 2021). Other research done by Rahim has highlighted the importance of a company's reputation in handling

economic, social, and environmental issues on the company's financial performance (Rahim et al., 2024). GDP per capita could either increase the market size lead to an increase in return of assets or decrease the return of assets due to the incentive to pursue economic growth of the company. However, looking at the stage Indonesia is currently in. A decrease in ROA due to the green transition could be justified by remembering the heavy dependency of coal mining companies on coal mining activity, and current GDP per capita (Barabanov et al., 2021; Setiawan et al., 2021). Therefore, this research would like to explore the relation between GDP per capita and ROA with the hypothesis as follows:

H15: GDP per capita Granger cause changes in ROA

H16: ROA Granger cause changes in GDP per capita

9. GDP per capita \leftrightarrow D/E

As previously mentioned, GDP per capita could determine the market size and the readability of the market to use renewable energy. GDP per capita, representing the market, will also have concern over the sustainability of the company investment (Rahim et al., 2024). Companies need to adjust to the changing preferences and the need to transition to combat climate change. However, doing so requires a low level of financial constraint for the company (Lv & Zhou, 2023). Which lot of coal mining company relies on debt financing to finance their investment. Therefore, the growth of GDP per capita may lead to better financial conditions for the company, and the company with low D/E could capture the opportunity or be ready to invest. The hypotheses will be used are as follows:

H17: GDP per capita Granger cause changes in D/E

H18: D/E Granger cause changes in GDP per capita

10. International coal prices \leftrightarrow Stock prices

The change in international coal prices may affect the company's financial performance, thus affecting the market performance. The change in international coal prices, according to Zhao's research, will shift the market preferences into using renewable energy (W. Zhao et al., 2021). The researcher would like to explore the relationship between international coal prices on stock prices. Since it could show the impact of the international coal price on the company's market performance (Sukamulja, 2021). The researcher also would like to explore the relations between stock price on international coal prices, which reflect the expectations of market demands of fossil fuel energy. The hypotheses will be used are as follows:

H19: International coal prices Granger cause changes in stock prices

H20: Stock prices Granger cause changes in international coal prices

11. International coal prices \leftrightarrow ROA

A shift in market preferences due to the increase in coal prices into using renewable energy could incentivize companies to allocate their resource to develop or invest in greener infrastructure (Barabanov et al., 2021; W. Zhao et al., 2021). A company that pursues green investment and green transition will gain support due to investors, customers, and other stakeholders to invest and use their product (Rahim et al., 2024). Which will have an effect on the company's ROA (Sukamulja, 2021). Increased investment in renewable energy and reduction of reliance on mining activity may also affect international coal prices. On the other hand, coal mining companies can benefit from the rise of international coal prices on their ROA. Without government policy, the coal mining company will not have incentives to invest in green projects (Borghesi et al.,

2022). This research would like to explore the relation of this variable with the hypothesis as follows:

H21: International coal prices Granger cause changes in ROA

H22: ROA Granger cause changes in international coal prices

12. International coal prices \leftrightarrow D/E

In the countries that rely on natural resources to support economic growth, such as Indonesia. There could be an increase in the energy consumption (Hieu, 2022). The preferred energy is coal, and it is influenced by international coal prices (Maulana & PP, 2024; Setiawan et al., 2021). Meanwhile, some research stated that a decrease in coal prices could stimulate coal consumption (W. Zhao et al., 2021). Therefore, a change in international coal prices could possibly affect the company's financing strategies (Sukamulja, 2021). On the other side, the company that has a low D/E ratio faces lower financial constraints (Lv & Zhou, 2023). Thus, this research would like to explore the relations of these variables with the hypothesis as follows:

H23: International coal prices Granger cause changes in D/E

H24: D/E Granger causes changes in international coal prices

13. Stock prices \leftrightarrow ROA

In determining the investment choice, many investors pursue short-term financial growth (Setiawan et al., 2021). This is reflected in the company's return on assets, which defines the capability of the company to generate a return from its assets (Sukamulja, 2021). ROA also shows the rate of return from the company's investment decision. However, there is also an increase in the market preference to choose to invest in sustainable companies (Borghesi et al., 2022; Rahim et al., 2024). The ROA also could define the industry structure and their readiness to conduct green transition (Zademach & Dichtl, 2016).

Therefore, the researcher would like to explore the relation of this variable with the hypothesis as follows:

H25: Stock prices Granger cause changes in ROA

H26: ROA Granger cause changes in stock prices

14. Stock prices \leftrightarrow D/E

The change in market behavior is already explained above. In fulfilling the market preferences, and needs. The company needs to have a certain degree of financial constraint to enable it to conduct the investment (Lv & Zhou, 2023). The D/E could explain the level of financial constraint and show the financing method of the company in their investment and transition project (Sukamulja, 2021). With the increase in their fund, the company can choose to invest the green projects with less reliance on debt financing, which also affects their company's reputation (Lv & Zhou, 2023). An increase in a company's reputation then affects how the market perceives the company and its incentives to invest in the company (Rahim et al., 2024). Therefore, this research would like to explore the relation of the variables with the hypothesis as follows:

H27: Stock prices Granger cause changes in D/E

H28: D/E ratio Granger cause changes in stock prices

15. ROA \leftrightarrow D/E

Chen's research stated that green investment will benefit the industry structure (M. Chen et al., 2023). The investment made by the company can be described by D/E. While the industry structure can be seen from company ROA. We can see company activity by analyzing this variable to undermine the source of the funds, and the effectiveness of the company in monetizing their assets from the investment and project (Lv & Zhou, 2023; Sukamulja, 2021).

Therefore, this research would like to explore the relation of the variables with the hypothesis as follows:

H29: ROA Granger cause changes in D/E

H30: D/E Granger cause changes in ROA

