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## ACCOUNTING, CORPORATE GOVERNANCE & BUSINESS ETHICS | RESEARCH ARTICLE

# The mediating role of green investment in political connection and carbon information disclosure: Empirical evidence in emerging stock market

Astrid Maharani<sup>1,2</sup>, Dian Agustia<sup>1\*</sup> and Alfiyatul Qomariyah<sup>1</sup>

**Abstract:** This study aims to expand this research by analyzing the mediating role of green investment in the influence of political connections on carbon information disclosure. The novelty of this study is the mediation model, which refers to a combination of upper echelons theory and stakeholder theory. The sample of this study totaled 197 firm years. This study uses a sample of energy and basic materials companies listed on the Indonesia Stock Exchange from 2017 to 2021. The results of the direct effect testing indicate that political connections affect carbon information disclosure. The findings show that green investment has a significant influence on mediating political connections and carbon information disclosure. This study confirms the mediating effect of the green investment variables. These results are supported by the robustness test results, which confirm the main conclusions. This indicates that the green investment made by the company mediates the political connection between the board of directors and the carbon information in its annual report or sustainability reporting. This study contributes to the literature on the role of green investment in mediating political connections in corporate top management to increase carbon information disclosure.

**Subjects:** Accounting; Corporate Social Responsibility & Business Ethics



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**Keywords: green investment; political connection; carbon information disclosure; upper echelons theory; stakeholder theory**

## 1. Introduction

This research was motivated by the fact that climate change has become a public concern in the last twenty-first century (Khalid et al., 2022; Luo et al., 2022; Nasih et al., 2019). Globally, the sustainability development goal (SDGs) policy is an important issue and concern for efforts to improve sustainability in the economic, social, and environmental fields. Indonesia's 2020–2024 Medium Term Development Plan refers to Sustainable Development Goals (SDGs). The targets of the 17 Sustainable Development Goals (SDGs) and their indicators have become integral parts of Indonesia's seven development agendas. The mission of Indonesia's 2020–2024 Medium-Term Development Plan is to achieve sustainable development to improve the quality of Indonesian people, achieve a productive, independent, and competitive economic structure, and provide equitable development. This indicates that every industrial sector must implement sustainable development through company policies and work programs.

The ratification of the Paris Agreement through Law Number 16 of 2016 mandated all countries, including Indonesia, to commit to efforts to reduce greenhouse gas (GHG) emissions. Indonesia has committed to reducing GHG emissions by 41% with international assistance or 29% under business as usual, as stated in the Nationally Determined Contribution (NDC) document. In addition, the Financial Services Authority supports the government's commitment to the Paris Agreement through efforts to develop sustainable finance, as outlined in the Sustainable Finance Roadmap Phase I (2015–2019) and Phase II (2021–2025). The Paris Agreement has set long-term goals to keep the global average temperature increase below 2°C and strive to limit the increase to 1.5°C. Each country's commitment to the Paris Agreement is reflected in the NDC document, requiring each nation to work towards national emission reductions and adapt to the impacts of climate change. The NDC document is dynamic; therefore, countries that have ratified the Paris Agreement are expected to periodically inform their ambitious targets for GHG emission reduction. Indonesia, through the NDC document, communicated a GHG emission reduction target of 41% with international support through climate financing, or 29% through business as usual, technology transfer, and capacity building from developed countries. To support the NDC, the government has introduced relevant policies and targets. These efforts require the mobilization of funds to support climate mitigation and adaptation activities.

Green movement is an integral element of stakeholder responses (Ambec & Lanoie, 2008; Dunk, 1999; Vandermerwe & Oliff, 1990). Today, external stakeholders play an important role in ensuring that companies invest in sustainability (Shanken & Smith, 1996; Warren & Jack, 2018). With regard to the green movement, companies are now required to be more environmentally conscious. The increase in the public's environmental concern causes a significant improvement in changing the CEO of a heavily polluting business (Gu et al., 2021). Therefore, it is important to consider (Kemp-Benedict, 2018). Green investment is defined as the process of adapting to climate change by reducing greenhouse gas emissions without significantly reducing a company's production and consumption of a company (Eyraud et al., 2011).

This research highlights the weaknesses of prior studies, as no previous studies have examined the mediating effect of green investment on the relationship between political connections and carbon information disclosure. This is based on earlier research showing that political connections directly influence carbon information disclosure (Cheng et al., 2017; Khalid et al., 2022; Khan et al., 2022). Meanwhile, research results reveal that there is an influence between political connections and green investment (Liu et al., 2022a; Song et al., 2022; Wang et al., 2018) and the influence of green investment and Carbon Information Disclosure company (Afni et al., 2018; Eyraud et al., 2013; Liu et al., 2022a).

A company CEO's political connections also influence how the company discloses carbon information. Several studies show that a company's political connections can influence the company to actively disclose the information environment and reveal it in accordance with regulations (Cheng et al., 2017; Khalid et al., 2022; Khan et al., 2022). Several studies have determined the influence of political connections on green investment (Song et al., 2022; Wang et al., 2018; Zhang et al., 2022). This reveals that the political connections of the board of directors have a positive influence on the company's green investment. In addition, an increase in the CEO's turnover in heavily polluting businesses was observed when businesses reduced their green investment spending when political connections increased (Gu et al., 2021).

The current study on the influence of green investment on carbon information disclosure is based on the fact that companies' investment in continuity will focus more on disclosure of carbon emissions (Afni et al., 2018; Eyraud et al., 2013; Liu et al., 2022a). Green investment is required to adapt to climate change by reducing greenhouse gas emissions without significantly reducing production and consumption (Eyraud et al., 2013). The expansion of green investment is related to technological advances and innovation. This is related to the use of new technology at the cost of R&D companies (Eyraud et al., 2013). The objective of this study is to determine the mediating role of green investment in the relationship between political connections and carbon information disclosure.

The novelty of this study lies in the mediation model, which is based on previous studies discussing the effect of political connections on green investment (Liu et al., 2022a; Song et al., 2022; Wang et al., 2018) and the effect of green investment on carbon information disclosure (Afni et al., 2018; Cheng et al., 2017). The mediation model in this study refers to a combination of upper echelons theory and stakeholder theory. This serves as the theoretical and empirical motivation for this research, as it suggests a relationship between political connections and green investment. Upper echelons theory states that a company leader owns policymaking as its main strategy. This strategy reflects their values and cognitions. The essence of this theory lies in the premise of the executive interpretation of what is encountered, consequences on moderate choices and decisions they make, and consequences on choices and decisions. Related to linkages between how the political connections owned by the CEO are combined with stakeholder theory, where the company is concerned with stakeholder interests in the decision of green investment and carbon information disclosure. Stakeholder theory explains that stakeholders are individuals or groups that can influence or be influenced by a company on the activity performed (Donaldson et al., 1995). This approach emphasizes cooperation between companies and stakeholders based on the concept of mutual benefits in creating continuity. This is related to the fact that when the political connection can affect how green investment decisions as well as a company's decision to conduct green investment, it will affect the disclosure of carbon information in fulfilling stakeholders' needs to make decisions. This also relates to how political connections affect corporate philanthropy (Wang et al., 2018). Based on theory, prior research, and observed phenomena, the research questions in this study are whether political connections have a direct impact on carbon information disclosure and whether green investment mediates the influence of political connections on carbon information disclosure.

The sample used in the study is energy and basic materials companies listed on the Indonesia Stock Exchange for the year 2017–2021, given that energy and basic materials companies have bigger responsibility to the environment. This sector prone to with environmental issues and have powerful stakeholders. This requires them not to make bad reputation in the society and among stakeholders (Chen & Ma, 2021; Nasih et al., 2019).

The sample used in the study is energy and basic materials companies listed on the Indonesia Stock Exchange for the year 2017–2021, given that energy and basic materials companies have greater responsibility to the environment. This sector is prone to environmental issues, and has

powerful stakeholders. This requires them not to create a bad reputation in society or among stakeholders (Chen & Ma, 2021; Nasih et al., 2019).

Consequently, this study makes the following contributions to the literature: First, in the implementation of Sustainable Finance Roadmap Phase I, the Financial Services Authority has, among other things, issued Regulation No. 51/POJK.03/2017 on the Implementation of Sustainable Finance for Financial Institutions, Issuers, and Public Companies. This regulation mandates that the entire financial sector adopts sustainable financial principles, submits Sustainable Financial Action Plans to the Financial Services Authority, and publishes Sustainability Reports for the public. This regulation emphasizes the importance of sustainable financial principles and marks the initial step toward deepening the market for sustainable project financing. The implications of this research extend to the parties directly involved, including the Financial Services Authority, Ministry of Environment and Forestry, and Ministry of Energy and Mineral Resources. These institutions may have heightened concerns regarding green environmental factors, which could lead to regulations or changes in law enforcement. In this regard, they developed the Green Taxonomy in 2022. Green Taxonomy can help align definitions of green activities and assets, and can be synchronized with sectoral targets outlined in Indonesia's Nationally Determined Contribution (NDC) document. Furthermore, Green Taxonomy is expected to serve as a transitional tool for providing access to funding for sustainable projects, assets, and activities. In the future, a Green Taxonomy can be developed to support innovative and feasible financing schemes for the financial sector, as well as promote the creation of green projects and green portfolios that can attract global investors. The government and other stakeholders can develop incentives to drive the development of new green products and services, including the presence of green investment funds or green verifications. The implications of this research provide insights into the Green Taxonomy regarding the disclosure of green investment by publicly traded companies on the Indonesia Stock Exchange each year.

Second, the findings from this green investment research have implications for the increased role of the Indonesian Institute of Accountants. With this research, it is hoped that the Indonesian Institute of Accountants can follow up on Green Taxonomy regulations by mandating companies to include disclosures of green investments in their financial reports or in discussions related to Indonesian Institute of Accountants regulations that support green investment in Indonesia.

Third, stakeholder theory influences both private and public sectors. The research's contribution to stakeholder theory is expected to provide insights into aspects that need to be considered in decision-making. This includes not only a company's profit information but also considerations related to the implementation of green investment and carbon information disclosure. Stakeholders are becoming increasingly concerned about environmental issues.

The remainder of this paper is organized as follows. Section 2 provides the background of this study. Section 3 presents the theoretical framework to explain the underlying predictions and hypotheses. Section 4 provides a literature review of the theory and hypothesis development. Section 5 outlines the research design, including data, variables, methods, and robustness tests. Section 6 reports and discusses the empirical results. Finally, section 7 summarizes and concludes the study.

## 2. Background

The serious concern of society and policymakers is directed towards climate change caused by the increase in companies' carbon emissions. Rising output in various sectors, including the industrial sector, contributes to carbon emissions, which can exceed tolerable limits. As a reflection of Indonesia's commitment to implementing green investment, several activities align with the global mission of Sustainable Development Goals (SDGs) and Indonesia's 2020–2024 Medium Term Development Plan. Several regulations have been introduced in Indonesia for the technical implementation of these goals, in line with global regulations, to accelerate progress related to

green investment. Additionally, one of the reforms undertaken in Indonesia is the launch of Green Taxonomy Edition 1.0 in 2022. Green Taxonomy was developed by the Financial Services Authority in collaboration with various ministries, including the Ministry of Environment and Forestry, Ministry of Industry, Ministry of Marine Affairs and Fisheries, Ministry of Energy and Mineral Resources, Ministry of Transportation, Ministry of Agriculture, Ministry of Tourism and Creative Economy, and Ministry of Public Works and Housing.

Green Taxonomy is a classification of economic activities that supports environmental protection and management efforts, as well as climate change mitigation and adaptation (Jasa Keuangan, 2022). The presence of a Green Taxonomy is expected to be utilized by relevant stakeholders to obtain information about green financing, funding, or investments, as well as to understand their risk management. With the Green Taxonomy Policy in Indonesia, it is hoped that all companies will be able to implement this regulation. The existence of several regulations related to the implementation of green investment in Indonesia is the reason why this research was conducted to study the regulatory impact on actual practices related to green investment in the field.

In this study, green investment is suspected to mediate how CEO decisions, especially those with political connections, influence companies' disclosure of carbon-related information. The mediating role of green investment is a response to the shortcomings of prior studies, as no previous research has examined the mediating influence between political connections and carbon information disclosure. This is based on earlier research demonstrating that political connections have a direct impact on carbon information disclosure (Cheng et al., 2017; Khalid et al., 2022; Khan et al., 2022). Meanwhile, research results reveal that there is an influence between political connections and green investment (Liu et al., 2022a; Song et al., 2022; Wang et al., 2018) and the influence of green investment and Carbon Information Disclosure (Afni et al., 2018; Eyraud et al., 2013; Liu et al., 2022a).

From a stakeholder perspective, stakeholders within a company have both the incentive and capacity to identify and rank companies that engage in corporate sustainability initiatives and use measurable targets and action plans to reduce emissions before making decisions. Stakeholders, including the investing community, can exert direct and indirect pressure on boards and management through negotiations and feedback to ensure that companies undertake substantive climate-related initiatives to ensure gradual and sustainable improvements in corporate carbon disclosure (Haque & Ntim, 2022).

### 3. Theoretical framework

The stakeholder theory provides an understanding of the presence of parties related to a company's interests. Stakeholders are individuals or entities that may be affected by a company's objectives. Stakeholders are defined as those who have an interest or involvement in the company, whether they are individuals, groups, or organizations. The stakeholder theory shows that companies are responsive to the demands of their internal and external partners in adopting policies and implementing strategic decisions (Indriastuti et al., 2021). From the perspective of stakeholder theory, a company is not only an economic entity that runs business for its sake but also has to benefit parties that belong to the company's responsibility. Companies must be able to maintain good relations with stakeholders by understanding the wishes of stakeholders, especially stakeholders, who have an impact on the availability of resources used for company operations, such as employees, the company's top customers, and others. Stakeholder theory also requires managers to be able to manage stakeholder expectations and the value they create, and requires managers to understand what is wanted and what is created so that it is in accordance with what is expected by stakeholders. Some experts have defined it in various ways. Akpınar et al. (2008) define stakeholder theory as requiring managers to make strategic decisions and allocate resources in a way consistent with the different claims of stakeholder groups.



Upper echelon theory suggests that organizations reflect the characteristics and perspectives of their top management (Khalid et al., 2022). Political connections can assist companies in building a green images and disclosing them for carbon information disclosure. Previous research has demonstrated that political connections directly impact on carbon information disclosure (Cheng et al., 2017; Khalid et al., 2022; Khan et al., 2022). Political connection refers to the relationship between company executives/directors and government officials. Previous research has shown that political relations can not only replace weak investor protection and unstable political situations, but can also help companies obtain resources from the government. Thus, the relationship that a company has to use political benefits will affect existing affiliations at the expense of other interests within the company (Li et al., 2008).

The results of previous research prove that there is an influence of green investment on carbon information disclosure (Afni et al., 2018; Eyraud et al., 2013; Zhang et al., 2022). Carbon information disclosure is information about carbon emissions added and provided by the company in the company's annual report and sustainability report. Environmental legitimacy pressure, as a key aspect of organizational legitimacy, is the main factor for motivating companies to disclose carbon information (Haymawan et al., 2020). With the increasing operations of companies that produce carbon gas, it can be one of the causes of increasing world carbon emissions. The company is expected to be transparent to the public, especially investors, that the company has shown concern for the environment. Companies can realize this transparency by disclosing information on carbon emissions. Through this openness, it is hoped that the public, especially investors, will increasingly believe that it is not only financial reports that need attention, but also other important information such as disclosure of carbon emissions (Bae Choi et al., 2013). Although it is still voluntary in practice, in the context of the energy and basic materials sectors, companies must demonstrate their concern for environmental issues. This is because these industrial sectors face significant challenges and inherent risks related to natural resources, making sustainability a critical issue (Mahmudah et al., 2023).

Previous research has shown that green investment influences carbon information disclosure (Afni et al., 2018; Eyraud et al., 2013; Zhang et al., 2022). Carbon information disclosure is information about carbon emissions added and provided by the company in its annual report and sustainability report. Environmental legitimacy pressure, a key aspect of organizational legitimacy, is the main factor motivating companies to disclose carbon information (Haymawan et al., 2020). The increasing number of companies that produce carbon gas can be one of the causes of increasing global carbon emissions. The company is expected to be transparent to the public, especially investors, that it has shown concern for the environment. Companies can achieve this transparency by disclosing information on carbon emissions. Through this openness, it is hoped that the public, especially investors, will increasingly believe that it is not only financial reports that need attention, but also other important information, such as disclosure of carbon emissions (Bae Choi et al., 2013). Although voluntary in practice, in the context of the energy and basic materials sectors, companies must demonstrate their concern for environmental issues. These industrial sectors face significant challenges and inherent risks related to natural resources, making sustainability a critical issue (Mahmudah et al., 2023).

Applying green investment is one of a company's strategies to increase profits without destroying the environment. Green investment is an important decision for companies to pay attention to (Kemp-Benedict, 2018). Green investment can provide community legitimacy for the company because the company seeks to orient itself according to the norms that apply to society and the environment. Green investment is needed to minimize greenhouse gas emissions and air pollution without reducing the business processes of non-energy companies, both public and private investments (Eyraud et al., 2011). Green investment is a broad concept that refers to the use of green capital mobilized from the government and industry to invest in environmental goods and services, such as protecting ecosystem diversity and compensating for climate change. Green investment is a socially responsible investment that adheres to the concept of an ecological civilization.

Businesses should be encouraged to make green investments based on three main social responsibilities: environmental protection, conservation of natural resources, and justice. Meanwhile, green investment is integrated with circular economic objectives and the creation of a harmonious society. It aims to achieve long-term social and economic development by coordinating and integrating the economic, environmental, and social benefits. Green investment is an environmentally friendly business strategy for gaining and maintaining legitimacy and support from interested parties. Thus, the company reduces the environmental impact of its operations by reducing its energy consumption and carbon emissions. The annual report revealed a company's concern for the environment. Furthermore, the community and stakeholders determine the results of the interpretation of the company's disclosures. The combination of upper echelon theory and stakeholder theory strengthens companies' ability to act as a result of political connections within the company in disclosing carbon information, which is mediated by green investment decision actions by companies that respond well to stakeholders. Stakeholders are now more sensitive to the green movement carried out by companies to create mediation between political connections (decision makers), and the impact of this is mediated so that carbon information disclosure is increasingly well disclosed by companies (Cheng et al., 2017; Luo et al., 2022).

#### 4. Literature review and hypothesis development

Upper echelon theory reveals that the organization is a reflection of top management (Khalid et al., 2022). According to this theory, the CEO's background is important for the strategic decision-making process in disclosing carbon information (Khalid et al., 2022). Having a political connection helps companies build a "green image" and disclose it through carbon information disclosure. Previous research has shown that political connections have a direct effect on carbon information disclosure (Cheng et al., 2017; Khalid et al., 2022; Khan et al., 2022). It is based on the fact that shareholders, regulators and other stakeholders must have an integrating perspective in motivating companies to disclose high-quality carbon information (Khan et al., 2022). Environmental legitimacy pressure, a key aspect of organizational legitimacy, is a major factor that motivates companies to disclose carbon information. Companies use political connections to inform them that they are aware of carbon information. Thus, companies with CEOs with political connections have the ability to disclose more of the company's carbon information in sustainability reporting. Based on the theory, empirical literature, and research setting or contextual insights, the hypotheses are as follows:

**H<sub>1</sub>:** Political connection has a direct effect on carbon information disclosure.

Upper echelon theory reveals that the organization is a reflection of top management (Khalid et al., 2022). Having a political connection helps companies build a "green image" and decide how much money the company will invest in stakeholders. This theory states that the CEO's background is important for the strategic decision-making process (Khalid et al., 2022). In the context of this study, corporate decision making is related to the allocation of green investment activities and carbon information disclosure. Previous research has revealed the influence of political connections on green investment (Liu et al., 2022a; Song et al., 2022; Wang et al., 2018).

Stakeholder theory requires that managers make strategic decisions and allocate resources in ways consistent with the different claims of stakeholder groups. Previous research has shown that green investment influences carbon information disclosure (Afni et al., 2018; Eyraud et al., 2013; Zhang et al., 2022). Green investment is required to adapt to climate change by reducing greenhouse gas emissions without significantly reducing production and consumption (Eyraud et al., 2011). Green investment can come from domestic investment as a source of private sector financing and technology transfer between countries. This industry uses environmentally friendly raw materials and technologies, which do not produce emissions but have added value, with the concepts of reduction, reuse, recycling, and recovery. According to the Indonesian Ministry of



Industry, the criteria for a green industry are a group of potential investment sectors that are driven as environmentally friendly green investments managed by the private sector, which includes agriculture, forestry, fisheries, geothermal power concessions, processing industries such as biomass, biofuels, manufacturing industries, low-cost green car components (LCGC), procurement of electricity from renewable sources, procurement of electricity from renewable sources, biogas, waste or waste, waste management and recycling, and natural tourism. RI Law No. 3/2014 on industry (articles 77–83) regulates green industry in Indonesia. Green investment expansion is related to technological progress and innovation. This is related to the use of new technology, which is in turn related to the costs of R&D companies (Eyraud et al., 2013). In the financial sector, concerns for and responsibility for the environment have increased investment opportunities for green mutual funds. Economic growth leads to a higher demand for energy resources, which then increases emissions levels and potentially adds to environmental degradation (Eyraud et al., 2013).

The combination of upper echelon theory and stakeholder theory strengthens companies' ability to act as a result of political connections within the company in disclosing carbon information, which is mediated by green investment decision actions by companies that respond well to stakeholders. Stakeholders are now more sensitive to the green movement carried out by companies to create mediation between political connections (decision makers), and the impact of this is mediated so that carbon information disclosure is increasingly well disclosed by companies (Cheng et al., 2017; Luo et al., 2022). Based on the theory, empirical literature, and research setting or contextual insights, the hypotheses are as follows:

**H<sub>2</sub>:** Green investment mediates the effect of political connection on carbon information disclosure.

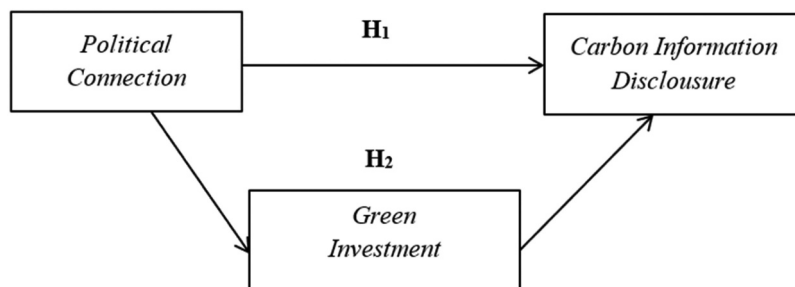
Based on the literature review, the research framework of this study is presented in Figure 1. This mediation model explains the mechanism of the relationships between the variables, namely (1) carbon information disclosure as the dependent variable, (2) political connection as the independent variable, and (3) green investment as a mediation variable. Figure 2 shows the detailed three-step mediation procedure used in this study.

## 5. Research design

### 5.1. Data and sample selection

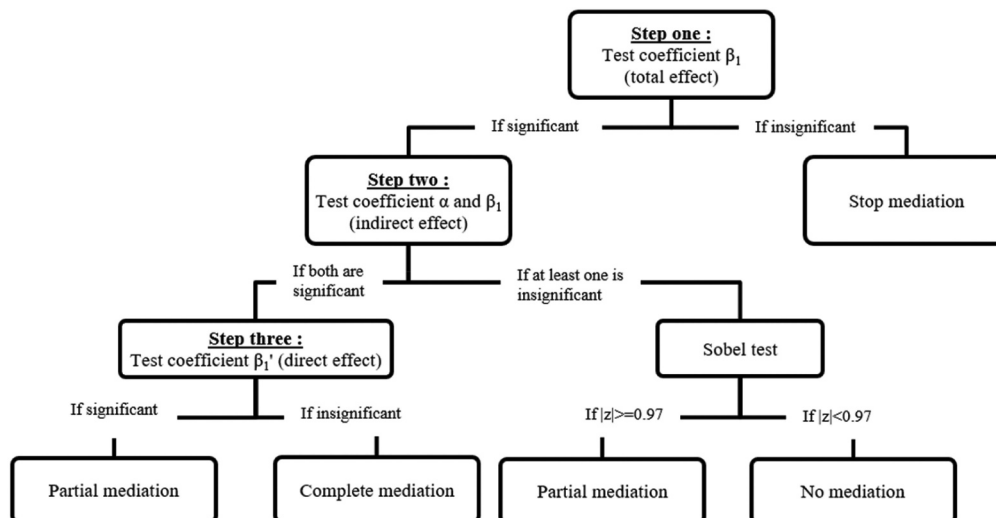
This study used the population of all companies listed on the Indonesia Stock Exchange from 2017 to 2021. The total population consists of 3,399 firm years. From this total population, 38 firm-years were excluded because of delisting from the Indonesia Stock Exchange during the same period. The sample in this study comprises energy and basic materials companies listed on the Indonesia Stock Exchange during the 2017–2021 periods. After excluding non-energy and basic materials companies, the total number of energy and basic materials companies was 235 firm-years. Next, the total number of energy and basic materials companies was further reduced by 21 firm-years

Figure 1. Research framework.



**Figure 2. Mediation procedure.**

Source: Zhao et al. (2010)



**Table 1. Selection of firms for the Year 2017–2021**

Description	Total
Population All companies listed on IDX within 2017–2021	3399
All companies listed on IDX within 2017–2021	
Minus:	
Delisting companies	(38)
	3361
Non-energy and basic material companies	(3126)
	235
Companies with incomplete data and unavailable report	(21)
	214
Outlier data	(17)
Total sample companies	<b>197</b>

with incomplete data, those that did not report annual or sustainability reports, and 17 firm-years with outlier data. Following the sample selection process, the final sample consists of 197 firm-years. In this study, descriptive statistics such as the mean, median, maximum, minimum, and standard deviation of the research data were calculated. This was used to determine the condition of the data from the research variables. The results of the descriptive statistical calculations were in the form of nominal data, which were explained descriptively based on the processed data (Table 1).

## 5.2. Measurement

This section clarifies the dependent, independent, mediating, and control variables used. It explains operational definitions, data sources, and references used in measuring these variables (Table 2).

### 5.2.1. Dependent variable

The dependent variable in this study was carbon information disclosure. Environmental legitimacy pressure, as a key aspect of organizational legitimacy, is the primary factor that motivates companies to disclose carbon information. The carbon information disclosure variable was measured using content analysis in the company's annual report (Bae Choi et al., 2013) with the carbon information disclosure checklist attached to Appendix A.

**Table 2. Variable definitions**

Variable	Definition	Data source	Reference
<i>Dependent variable</i> Carbon Information Disclosure (CID)	A dummy variable, that takes the value of 1, if the firm voluntary discloses the carbon information and 0 otherwise	Annual report and sustainability report	Bae Choi et al. (2013)
<i>Independent variable</i> Political Connection (PC)	A dummy variable that takes the value 1, if an independent director is politically connected, zero otherwise	Annual report	Khan et al. (2022), Wang et al. (2018)
<i>Mediating variable</i> Green Investment (GI)	$GreenInvestment = \log \frac{greeninvestment}{\frac{totalassets}{1000}}$	Annual report and sustainability report	Liu et al. (2022b)
<i>Control variable</i> Firm Size (Size)	Natural logarithm of total assets	OSIRIS	Luo et al. (2022), Nasih et al. (2019)
Leverage (Lev)	The ratio of total debt to total assets	OSIRIS	Khan et al. (2022), Nasih et al. (2019)

### 5.2.2. Independent variable

The independent variable in this study was political connection. Political connections refer to the relationship between executives or directors of a company and government officials. Previous research has shown that political connections not only substitute for weak investor protection and unstable political situations but also assist companies in obtaining resources from the government (Fan et al., 2007; Khalid et al., 2022; Liu et al., 2022a). The measurement of the political connection variable using a dummy variable is based on previous research (Khan et al., 2022; Wang et al., 2018). Dummy variable with a value of 1 if the independent director is politically connected and zero otherwise. With a political connection, a director has previous or current work experience as a government entity.

### 5.2.3. Mediating variable

The mediating variable in this study was green investment. Green investment is a company's effort to manage environmental problems by reducing the negative impact of business activities on the environment. Therefore, green investment can increase a firm's competitive advantage, reputation, and corporate value. Green investment was measured using an annual report based on (Liu et al., 2022a):

$$Green\ Investment = \log \frac{green\ investment}{\frac{total\ assets}{1000}}$$

The direction of green investment mainly includes pollution control costs listed in the annual report and the company's sustainability report includes "general and administrative costs", "non-operational costs", "construction in progress", "expenses for research and development" (Liu et al., 2022a) by using variable dummy scoring. Later, a content analysis is carried out to measure green investment with accounting items related to green investment (disclosed in the annual report and/or sustainability report) which is attached to Appendix B.

### 5.2.4. Control variable

This study included a number of control variables in the analysis to control for other factors that might influence the research variables and interfere with the results of the variable testing. The purpose of including this control variable was to avoid misspecification of the empirical model used in the study and to avoid biased calculation results. The control variable used in this study had an influence on the carbon information disclosure variable, namely company size (Luo et al., 2022; Nasih et al., 2019) then leveraging (Khan et al., 2022; Nasih et al., 2019).

### 5.3. Model specification

Following Hayes (2018), we adopted a three-step procedure to estimate the mediating effect of green investment (GI) on the relationship between political connection (PC) and carbon information disclosure (CID). The first step was to examine whether a causal relationship exists between PC and CID. The second step examines whether a significant relationship exists between the independent variable (PC) and mediator variable (GI), estimated using Equation (1). The third step was to examine the effect of the independent variable (PC) on the dependent variable (CID) when controlling for the mediator (GI), estimated using Equation (2). The regression models are as follows:

$$CID_{i,t} = \beta_0 + \beta_1 PC_{i,t} + \sum Control_{it} + \varepsilon_{it} \quad (1)$$

$$GI_{i,t} = \alpha_0 + \alpha_1 PC_{i,t} + \sum Control_{it} + \varepsilon_{it} \quad (2)$$

$$CID_{i,t} = \beta'_0 + \beta'_1 PC_{i,t} + \beta_2 GI_{i,t} + \sum Control_{it} + \varepsilon_{it} \quad (3)$$

where  $CID_{i,t}$  denotes carbon information disclosure, measured using a dummy variable, taking the value 1 if the firm voluntarily discloses the carbon information and 0 otherwise in the annual report and sustainability report;  $PC_{i,t}$  denotes the political connection using a dummy variable, taking the value 1 if an independent director is politically connected, zero otherwise in the annual report; and  $GI_{i,t}$  denotes the content analysis for measuring green investment with accounting items related to green investment (disclosed in annual reports and/or sustainability reports). The control variables included company size and leverage.

The mediating effect of green investment on the relationship between political connections and carbon information disclosure was examined (Figure 1). The detailed three-step mediation procedure is shown in Figure 2. Equation (1) tests the total effect of political connections on carbon information disclosure ( $\beta_1$ ): If  $\beta_1$  is significant (otherwise, the analysis is terminated), the process proceeds to Equations (2) and Equation (3), which examine the indirect effect of political connections on carbon information disclosure mediated by green investment. If both the indirect effects ( $\alpha_1$  and  $\beta_2$ ) and direct effect ( $\beta'_1$ ) are significant, then a partial mediation effect exists (Hayes, 2018). Otherwise, if the direct effect ( $\beta'_1$ ) is insignificant but the indirect effects ( $\alpha_1$  and  $\beta_2$ ) are significant, a complete mediation effect exists.

### 5.4. Robustness test

To ensure the reliability of the empirical results, we conducted a robustness test using alternative measures of the mediating variable. Specifically, we replaced the GI variable with the natural logarithm of green investment ( $\ln(GI)$ ) in the regression model, as suggested by (Chen & Ma, 2021). These robustness tests aimed to confirm the economic and statistical significance of the empirical findings.

## 6. Empirical results and analysis

### 6.1. Empirical results

The mean, standard deviation, and minimum and maximum values for each model's variables are presented in Table 3. This study uses unbalanced panel data. Table 3 shows that the averages for green investment (GI), political connection (PC), carbon information disclosure (CID), company size (Size), and leverage (Lev) are positive. All these data indicate that the data varied greatly. Data on green investment, political connections, carbon information disclosure, company size, and leverage have the highest distribution, as evidenced by the highest standard deviation value.

**Table 3. Descriptive statistics**

Statistic	GI	PC	CID	Size	Lev
Mean	5,93724	0,15	0,33403	22,95590	0,25378
Maximum	8,066	1	0,862	25,479	0,820
Minimum	0,000	0	0,000	14,994	0,000
Std. Deviation	1,968453	0,360	0,307653	1,833136	0,203080
Observations	197	197	197	197	197

Source: The Processed Secondary Data (2023).

The Pearson correlation results are presented in Table 4, indicating that there is no endogeneity problem among the variables. The above table shows that there is no multicollinearity problem in the model. This is shown by the coefficient numbers below.

According to Table 5, in Model 1, green investment plays a mediating role, which partially influences the political connection with carbon emission disclosure. Model 1 is the result of the test without the control variable, Model 2 is the result of the test with the control variable, and Model 3 is the result of the robustness test. Overall, Model 1 had high goodness of fit ( $F = 14,7914$ ;  $p = 0,000$ ). In addition, Model 1 can be explained by 18.6 a carbon information disclosure. This result is consistent with a previous study showing that the green investment variable has a mediating influence. The mediation effect indicates that political connections influence green investment (Song et al., 2022; Wang et al., 2018; Xue et al., 2022) and that green investment influences carbon information disclosure (Afni et al., 2018; Cheng et al., 2017).

Model 2 was used as the core model in this study. The results of direct effect testing in this study indicate that political connections influence carbon information disclosure, with a p-value of 0.000 (H1 accepted). These results are in line with previous research, which found that political connections are strongly associated with a significant direct effect on carbon information disclosure (Khan et al., 2022). The findings show that green investment has a significant influence in partially mediating political connections on carbon information disclosure, with a p-value of 0.000 (H2 accepted). The mediating effect of green investment variables has been partially proven by previous research that found an effect of political connections on green investment (Song et al., 2022; Wang et al., 2018; Xue et al., 2022) and the influence of green investment on carbon information disclosure (Afni et al., 2018; Cheng et al., 2017).

Model 3 was used as a robustness test in this study. To verify the reliability of the empirical results, the following robustness tests were conducted. By using the natural green investment logarithm (Ln (GI)) as a substitute for the GI variable to regress the model referring to Chen and Ma (2021), the robustness test results confirm the core model results. The results of the robustness test confirmed the significance of the mediating role of the green investment variable on the influence of political connections and carbon information disclosure.

**Table 4. Pearson correlations**

Variables	(1)	(2)	(3)	(4)	(5)
(1) GI	1,000				
(2) PC	0,203	1,000			
(3) CID	0,327	0,327	1,000		
(4) Size	0,403	0,222	0,309	1,000	
(5) Lev	-0,180	0,064	-0,213	0,112	1,000

Source: The Processed Secondary Data (2023).

**Table 5. Regression results**

Independent Variable	Model 1	Model 2	Model 3
Constant	0,0348 (0,5962)	-0,6782*** (-2,6464)	0,0531 (0,7551)
GI	0,0471*** (4,4092)	0,0257** (2,2397)	
LnGI			0,1522*** (3,8034)
PC	0,1286** (2,2035)	0,1189** (2,0885)	0,1417** (2,4124)
Size		0,0404*** (3,3110)	0,041*** (5,321)
Lev		-0,3376*** (-3,3257)	-0,221*** (-2,875)
N	197	197	197
R2	0,3637	0,4563	0,3341
Adj. R2	0,1323	0,2082	0,1116
F	14,7914	12,6212	12,1858
Mediation effect <b>Total effect mediated</b>	Partial 18,19%	Partial 13,73%	Partial 18,19%

<sup>a</sup>The estimated coefficient is displayed on the first row; and the t-value of significance is in parentheses.

<sup>b</sup>All tests are two-tailed, \*\*\* if  $p < 0.01$ , \*\* if  $p < 0.05$ , \* if  $p < 0.1$ .

Source: The Processed Secondary Data (2023).

## 6.2. Analysis

The results show that political connections have a direct influence on carbon information disclosure by energy and basic materials companies in Indonesia. As a representation of emerging markets, this proves, as in previous studies, that the connection and advisory role of independent directors encourages companies to disclose carbon-related information (Khan et al., 2022). This is in line with the results of previous research, which found a direct effect of political connections on carbon information disclosure (Liu et al., 2022a; Song et al., 2022; Wang et al., 2018).

The following shows the results of testing the mediating role of the green investment variable on the indirect effect of political connections on carbon information disclosure. With the green investment mediation process, it is expected that companies can optimize environmentally friendly technologies that do not produce emissions but have added value, with the concepts of reduce, reuse, recycle, and recovery so that directors who are concerned with green investment are needed to increase the quality of carbon emission disclosures. In the research conducted by Nasih et al. (2019) it is stated that the disclosure of carbon information in Indonesia is voluntary, but in this study it shows that companies make disclosures by considering several things such as suitability with the interests of stakeholders and existing environmental threats, especially for those companies who produce greenhouse gases. This confirms the stakeholder theory. The results of this study confirm upper echelon theory. Upper echelon theory reveals that the organization is a reflection of top management (Khalid et al., 2022). Having a political connection helps companies build green investments and disclose carbon information. This is based on the fact that shareholders, regulators, and other stakeholders must have an integrating perspective in motivating companies to disclose high-quality carbon information (Khan et al., 2022). The results of this study confirm the combination of upper echelon theory and stakeholder theory to strengthen companies' ability to act with political connections within the company to disclose carbon information, which is mediated by green investment decision actions that are well responded to by stakeholders. Top management with political connections has more access to and concern for



government regulations so that they can disclose more company carbon information by increasing green investment activities that refer to the upper echelon theory. A more comprehensive disclosure is carried out by means of carbon information disclosure to meet the wider information needs of stakeholders, referring to stakeholder theory. The statistical results from the robustness test support the main test results of this study, indicating that this variable is robust and convincing as an explanatory variable. The results of the robustness test confirmed that green investment is a mediating variable between political connections and carbon information disclosure.

In fact, the top management of energy and basic materials companies in Indonesia is increasingly concerned with making green investments and making companies better at disclosing carbon information. This is because of the increasing awareness of the impact of company operations on social and environmental conditions. Company stakeholders who are increasingly aware of the policies of the company's top management being concerned with increasing green investment are expected to be better at delivering quality carbon information disclosure. It is this stakeholder role that also supports the company to do better according to the mission of sustainable development both regionally (Indonesia's 2020–2024 Medium-Term Development Plan) and globally (SDGs).

## 7. Summary and conclusions

This study aims to expand this research by analyzing the mediating role of green investment in the influence of political connections on carbon information disclosure. This study uses a sample of energy and basic materials companies listed on the Indonesia Stock Exchange from 2017–2021. The sample of this study totaled 197 firm years. The data in this study were collected from the annual report, sustainability reporting, and OSIRIS statistical testing, with reference to the mediation model by Hayes (2018) and a robustness test using natural logs from green investment. The results of direct effect testing indicate that political connections influence carbon information disclosure. The findings show that green investment has a significant effect on mediating political connections and carbon information disclosure. This study confirms the mediating effect of the green investment variable, indicating the influence of political connections on green investment, and the influence of green investment on carbon information disclosure.

This study contributes to the literature in several ways. First, it indicates the importance of political connections within the board of directors in carbon information disclosure. The board of directors not only plays a role in supervising and advising management but also upholds a high sense of social responsibility in the context of energy and basic materials in Indonesia, which are closely related to natural, environmental, and social exploration. Second, the green investment made by the company mediates the political connection between the board of directors and the carbon information disclosed by the company in its annual report or sustainability reporting. Third, the implementation of green taxonomy regulations is related to the development of green investment disclosure in publicly traded companies on the Indonesian Stock Exchange. Fourth, the findings of this green investment research have implications for the increased role of the Indonesian Institute of Accountants. With this research, it is hoped that the Indonesian Institute of Accountants can follow up on green taxonomy regulations by mandating companies to include disclosures of green investments in their financial reports or in discussions related to Indonesian Institute of Accountants regulations that support green investment in Indonesia. Fifth, stakeholder theory influences both the private and public sectors. The research's contribution to stakeholder theory is expected to provide insights into aspects that need to be considered in decision-making. This includes not only a company's profit information but also considerations related to the implementation of green investment and carbon information disclosure. Stakeholders are becoming increasingly concerned about environmental issues.

This study has several limitations. First, it is related to the unfair results of research when generalizing to other markets. This is because the characteristics of each market in the other countries vary. Future research can expand to countries other than emerging markets by comparing developed countries with emerging markets to obtain more comprehensive results in several countries using control variables that reflect country characteristics. Second, this study uses

proxies from previous research. Future research can create a new proxy that comprehensively describes green investment in accordance with the latest global and regional policies.

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## Appendices

### Appendix A. Carbon emission disclosure information checklist

No.	Category	Item	Note
1.	<b>Climate Change (CC): Risks and Opportunities</b>	CC1	Assessment/Description of risks (regulations, both special and general) relating to climate change and actions seized or to be seized as a risk management step.
		CC2	Assessment/Description of financial, business, and opportunities implications for climate change both now and in the future.
2.	<b>Greenhouse Gases (GHG): Accounting for Greenhouse Gas Emissions</b>	GHG1	Describe the methods utilized in calculating greenhouse gas (GHG) emissions.
		GHG2	Continuity of external verification of the quantity of greenhouse gas (GHG) emissions.
		GHG3	Total greenhouse gas emissions—metric tons of CO—that are produced.
		GHG4	Disclosure of scope 1, 2 and 3 directly on greenhouse gas emissions.
		GHG5	Disclosure of the greenhouse gas emissions that come from resources (e.g., electricity, coal).
		GHG6	Disclosure of greenhouse gas emissions that come from the facilities or segment level.
		GHG7	Comparison of greenhouse gas emissions with the prior year.
3.	<b>Energy Consumption (EC)</b>	EC1	Total energy devoured.
		EC2	The quantity of energy used that comes from renewable resources.
		EC3	Disclosures based on type, facility, or segment.

(Continued)

<b>(Continued)</b>			
<b>No.</b>	<b>Category</b>	<b>Item</b>	<b>Note</b>
4.	<b>Reduction and Cost (RC)</b>	RC1	Explain the planning or strategies in reducing greenhouse gas emissions.
		RC2	Specifications of the level of reduction of greenhouse gas emissions and the targets per year.
		RC3	Emission reductions and costs are borne or to be provided.
		RC4	Costs of future emissions included in capital planning.
5.	<b>Accountability of Cost and Carbon Emission (ACC)</b>	ACC1	Indications where the board of the committee or executive body has responsibility for activities concomitant to climate change.
		ACC2	Describe the mechanism made by the board or other executive bodies by reviewing the sustainability of the company concerning climate change.

**Appendix B. Checklist of accounting items related to green investment**

<b>General Ledger</b>	<b>Line Items</b>
General and Administrative Expenses	Emission charge Environmental testing fee Environmental protection expense Sanitation and afforestation fee River maintenance fee Mineral resources compensation fee Afforestation fee Environmental protection and afforestation fee Safety and environmental protection fee Water conservancy construction fund Technology development and mineral resource compensation fee Environmental pollution discharge fee Resource compensation fee Environmental protection and safety fee Emission and afforestation fee Soil erosion compensation fee Environmental protection verification fee Water resources tax Nursery stock maintenance fee Hygiene fee Water resources compensation fee Mining drainage water resources fee Water resource fee Land reclamation fee

(Continued)

General Ledger	Line Items
Non-operating expense	Special fund for water conservancy construction Waste treatment subsidy Tax rebates for special fund for water conservancy construction Sludge treatment subsidy Environmental penalty expense Special governance fund for environmental protection Environmental pollution compensation fee Environmental governance fund Environmental protection fee
Construction in progress	Coal to gas/oil to gas conversion Waste heat power generation Sludge drying reduction Coal-fired coupled sludge power generation Furnace electric dust removal transformation Clean heating Biomass gasification Desulphurization and denitrification Plume governance Geological environment governance Deposit for environmental restoration and governance of mines Technical fixed assets replacement Shutdown thermal power plants Ash and slag storage areas restore Denitrification expansion Heavy metal removal Medium pressure steam heating reformation
Research and development expenditures	Forest compensation fees Coal gangue power generation Research on ultra-low NO <sub>x</sub> emission technology Research on operation safety and environmental protection Technology improvements of waste incineration plant Technical improvement project