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Article

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Carbon Strategy, Political Connection and Carbon Performance: Evidence from Polluting Industries

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ABSTRACT

The increase in carbon emissions poses a significant threat to corporate performance, necessitating appropriate mitigation measures and strategies. However, the role of carbon strategies and political connections in enhancing carbon performance remains a subject of debate. Hence, this research examines the relationship between carbon strategies, types of carbon strategies, and political connections with carbon performance in polluting industries in Indonesia. The sample consist of 192 firm-year companies during 2016-2022. This study found: First, a combination of various types of carbon strategies will drive improvements in carbon performance. Second, compensation mechanisms can mitigate carbon emissions excesses. Third, the implementation of mitigation measures through innovation in processes and products can reduce carbon emissions. Fourth, political connections exacerbate corporate carbon performance. The research outcomes contribute to companies by providing insights into mitigation measures that can be undertaken to reduce carbon emissions and promote the achievement of Indonesia's vision of net-zero emissions.

Keywords: Carbon Performance, Carbon Strategy, Political Connection, Mitigation Strategy, Polluting Industries
JEL Classifications: M14, M41, Q56, Q52

1. INTRODUCTION

The reduction of carbon emissions has emerged as a primary concern in corporate performance, particularly since the establishment of the Paris Agreement and the Kyoto Protocol by the United Nations (UN). This arises from global apprehensions regarding the adverse impacts of corporate operations on Earth's sustainability (United Nations, 2015). Reports from the Intergovernmental panel on climate change (IPCC) have indicated widespread failures in carbon performance management across nations (IPCC, 2023).

Stakeholders have become increasingly cognizant of the significance of carbon performance indicators in business operations (Benkraiem et al., 2022). Shareholders have incorporated carbon emission dimensions into performance assessment metrics (Matsumura et al., 2014). Governments provide improved legal certainty when companies effectively manage carbon performance (Wang et al., 2022). Customers prefer environmentally friendly products that do not harm the environment (Moriarty and Honnery, 2008). These findings underscore the urgency for companies to measure, reduce, manage, and report carbon performance for informed decision-making (Qian and Schaltegger, 2017; Ratmono et al., 2021; Stechemesser and Guenther, 2012). In other words, companies play a crucial role in climate change mitigation by controlling carbon emissions.

According to stakeholder theory, companies need to adapt to new mechanisms and practices to safeguard business success from climate change risks (Cadez et al., 2019). The most effective way to enhance corporate performance is through the implementation of carbon strategies (Bui et al., 2022; Kasbun et al., 2019; Kraus et al., 2020; Luo and Tang, 2020; Olayeni et al., 2021). Carbon strategies are recognized as determining factors in a company's success in addressing emission mitigation pressures from stakeholders (Wahyuni and Ratnatunga, 2015). These strategies provide steps to reduce greenhouse gas emissions, capitalize on emission reductions, and respond to environmental demands from markets, governments, and communities (Hoffman, 2006). Carbon strategies integrate emission impacts into company policies and operational plans (Olson, 2008). Consequently, companies can identify carbon emission sources, measure their values, and explore alternative means to achieve climate change goals (Lee, 2012).

In uncertain business conditions, carbon strategies enable companies to have higher survival rates compared to their competitors (Hoffman, 2006; Weinhofer and Hoffmann, 2010). Companies that implement carbon strategies can enjoy environmental performance improvements through innovation in production processes (Linares-Rodríguez et al., 2022), gain competitive advantages (Olatunji et al., 2019), and enhance financial performance (Mao et al., 2017).

Climate change underscores the importance of government intervention in sustainability initiatives. Governments, acting as regulators, encourage companies in climate change mitigation efforts through emission reductions (Maung et al., 2016). Governments provide incentives such as tax relief, sanctions, and market opportunities when companies fulfill their environmental performance interests (Liu et al., 2020; Maung et al., 2016).

According to research dependent theory, the mechanism that companies can employ to ensure the availability of key resources from the government is through political connections (Hillman et al., 2009). Political connections can advance corporate performance (Sun and Zou, 2021; Wong and Hooy, 2018), secure special treatment such as tax relief (Firmansyah et al., 2022), gain government contracts and subsidies (Goldman et al., 2013), and even facilitate capital funding (Houston et al., 2014). Political connections have been recognized as one of the determinants of corporate success (Faccio, 2006).

Employees with political connections are more aware of environmental issues and strive to meet government demands (Wang et al., 2022). Politically connected employees drive green innovation processes (Desheng et al., 2021; Wang et al., 2022), invest in environmentally friendly technologies (Wang et al., 2018), and prioritize decision-making in the interests of key stakeholders (Wang et al., 2022).

Prior studies, albeit constrained in scope, have examined the nexus between carbon performance and various environmental strategies, encompassing dimensions such as green innovation, green investment, and carbon trading (Bui et al., 2022; Desheng et al., 2021; Huang et al., 2021; Khalil and Nimmanunta, 2021; Linares-Rodríguez et al., 2022; Luo and Tang, 2020; Shen et al., 2021; Zhang et al., 2022). These investigations suggest that the correlation between strategy and carbon performance remains ambiguous, fragmented, and subject to debate regarding the efficacy of strategies (Johnson et al., 2023). While some studies posit a positive impact of carbon strategies on carbon performance (Haque and Ntim, 2022), others indicate a negative association (Linares-Rodríguez et al., 2022). Notably, the assessed typologies of carbon strategies are deemed insufficiently intricate and fail to offer a comprehensive elucidation of carbon strategy dynamics. These findings corroborate criticisms positing that companies may employ carbon strategies as mere "greenwashing" tactics (Boiral, 2006; Deegan, 2002; O'Donovan, 2002). Additional critiques revolve around the relevance of indicators used to gauge carbon performance, binary measurements of carbon emissions (Akbaş and Canikli, 2019; Li et al., 2018), and scrutiny of disclosure indices (Elsayih et al., 2018; Jaggi et al., 2018). Furthermore, carbon performance research predominantly concentrates on developed nations, thereby yielding limited insights from high-emission developing countries like Indonesia (Velte et al., 2020).

Critiques from previous research underscore the importance of several reasons for conducting this research: Firstly, climate change mitigation remains a global trend (Olayeni et al., 2021; Roscoe et al., 2019; Singh et al., 2020). However, there are limitations in research specifically addressing climate change issues through carbon performance enhancement (Haque, 2017). Secondly, Indonesia is one of the countries that ratified the Kyoto Protocol and Paris Agreement into national regulations, making emission reduction a national objective. The government has issued various policies such as greenhouse gas inventory rules, carbon taxes, and carbon economic values to achieve the net-zero emission vision by 2060. To the researchers' knowledge, there is no existing research exploring carbon performance with a focus on developing countries like Indonesia. Thirdly, the complexity of carbon emissions' impacts on corporate sustainability necessitates ongoing exploration of appropriate strategy initiatives to enhance carbon performance. Previous research does not comprehensively depict the carbon strategy concept and yields inconsistent research outcomes (Huang et al., 2021; Jiang et al., 2022; Le, 2022; Li et al., 2021; Shen et al., 2021). Fourthly, previous research still focuses on addressing climate change risks using internal mitigation efforts. Meanwhile, political connections as one of the external factors driving emission reduction remain underexplored (Wang et al., 2022).

Thus, this research aims to explore the determinants of carbon performance in polluting companies in Indonesia. Specifically, the study examines the relationship between carbon strategies and carbon performance by incorporating current best practices in carbon mitigation actions. Unlike Linares-Rodríguez et al. (2022), carbon strategies are analyzed in terms of their comprehensive and separate relationships for each strategy dimension, offering a more complex analysis. Furthermore, the research analyzes the relationship between political connections and carbon performance, thereby expanding the exploration of emission mitigation phenomena. The study uses carbon intensity to depict actual company carbon performance. The carbon intensity proxy includes the entire scope of emission values, encompassing direct emissions, indirect emissions, and other indirect emissions (Scope 1, 2, 3), offering a comprehensive analysis of carbon emissions throughout the company's value chain.

This research contributes: Firstly, to Indonesia as one of the countries focused on emission reduction efforts. Secondly, the research contributes by providing a different model and research focus in climate change risk mitigation, namely analyzing the relationship between carbon strategies, carbon strategy dimensions, and political connections with carbon performance. Thirdly, the research findings contribute to initiating proactive measures or strategies for companies facing significant emission mitigation pressures.

2. LITERATURE REVIEW

2.1. Stakeholder Theory

The central tenet of stakeholder theory posits that a company's success is contingent upon the symbiotic relationship between management and stakeholders (Freeman, 1984). In a business environment replete with uncertainty, a company's existence fundamentally constitutes a compact between the company and a myriad of actors, both internal and external to the organization (Branco and Rodrigues, 2007). Stakeholder theory has been used as a foundation for explaining corporate responses to climate change (Hörisch et al., 2014; Luo and Tang, 2020). The success of a company imperiled by climate change risks can only be achieved when management is able to address the interests of its stakeholders (Hörisch et al., 2020). This theory explains that stakeholders demand environmental performance improvements. Companies are required to mitigate carbon emissions through appropriate business strategies (Bui et al., 2022; Zhang et al., 2022), report any business activities impacting climate change (Jaggi et al., 2018; Kılıç and Kuzey, 2019; Luo et al., 2022), and encourage decision-making that prioritizes environmental issues (Luo and Tang, 2020).

2.2. Resource Dependent Theory

Resource dependency theory discusses the relationship between organizations and resources (Salancik and Pfeffer, 1978). Organizations require resources (financial, physical, and informational) obtained from the environment, leading to their dependence on external sources providing these resources (Hillman et al., 2009). Dependency within organizations creates risks and uncertainties that ultimately affect performance (Pfeffer and Salancik, 2003:144). Therefore, companies need to establish linkages with external contingencies that create uncertainty and mutual dependence. The relationships formed by the organization will aid organizational stability amidst environmental changes and reduce uncertainty (Pfeffer and Salancik, 2003:145).

Resource dependency theory can be used to understand organizational behavior changes concerning resource dependency in addressing climate change (Wang et al., 2022). This aligns with Davis and Cobb (2010) stating that this theory can explain organizational behavior, structure, stability, and change. In the context of climate change, the government provides incentives and sanctions that can drive environmental performance improvement. Meanwhile, on the other hand, companies require resource assistance to address climate change. This leads to resource dependency between organizations and the government. Organizational dependency is reflected through ease of access to funding (Houston et al., 2014; Khatri-Chhetri et al., 2021; Mcleod et al., 2019), demands for climate change sanction relief (Maung et al., 2016), access to carbon trading (Weng and Xu, 2018; Zhao et al., 2017), tax incentives (Cansino et al., 2010; Markandya et al., 2009), and other financial incentives (Jonas et al., 2011).

2.3. Hypothesis Development

2.3.1. Carbon strategy and carbon performance

Carbon strategies are aimed at sustaining a company's success amidst climate change risks (Hoffman, 2006). This objective aligns with stakeholder theory, which is designed to ensure the company's sustainability in uncertain business conditions (Freeman, 2015). Stakeholder theory views carbon strategies as the company's response to meeting climate change demands from stakeholders (Kolk and Pinkse, 2007; Sprengel and Busch, 2011). Climate change subjects companies to a turbulent business environment and threatens their sustainability. This condition prompts stakeholders to demand performance improvements that can lead businesses to win in competition. Therefore, companies devise unique strategies and incorporate emission reduction goals into their business operations in the hope of creating value for stakeholders.

Actual greenhouse gas emissions can decrease when companies take advantage of technological advancements and adopt low-emission strategy models. Companies compensate for excess emissions through carbon trading among companies; in the production process, companies innovate by reducing emission combustion, production management, and replacing low-emission inputs; companies invest in renewable technologies to lower emissions from power generation (Damert et al., 2017; Radu et al., 2020; Wahyuni and Ratnatunga, 2015; Weinhofer and Hoffmann, 2010). Furthermore, the creation of green products through raw material and energy source efficiency can also reduce emissions at each production stage (Berrone and Gomez-Mejia, 2009; Busch and Hoffmann, 2007, 2011). Similarly, investments in end-of-pipe technologies can minimize emission-causing waste (Hart, 1995).

Research findings conducted by Bui et al. (2022) using climate disclosure project data found that carbon strategies significantly negatively influence carbon emissions (resulting in improved carbon performance). The research results indicate that dimensioned carbon strategies with integrated strategies, innovation, and value chain collaboration can enhance sustainable development goals through total carbon performance reduction. Carbon strategies help maintain and develop company resources, thereby reducing emissions. Linares-Rodríguez et al. (2022) found that carbon strategies can lead to better environmental performance (reduced carbon emissions) through carbon management, the use of eco-friendly technology, changes in business processes, or carbon emission offset projects. Therefore, the hypothesis in this research is as follows:

H1: Carbon strategies positively influence carbon performance.

2.3.2. Carbon compensation strategy and carbon performance

Stakeholder theory posits compensation strategies as transient survival mechanisms adept at swiftly addressing the exigencies of climate change (Sprengel and Busch, 2011). In the face of environmental uncertainties corroding business performance, the exigency for novel adaptations becomes imperative for organizational resilience. Stakeholders perceive compensation mechanisms as expedient avenues for emission reduction, obviating the necessity for operational overhauls (Kolk and Pinkse, 2007).

Theoretically, carbon offset strategies can augment carbon performance through carbon trading and investments in emission reduction projects (Boiral, 2006). Carbon trading enables companies holding excess emission quotas to mitigate their surplus by procuring emissions from low-quota counterparts. Meanwhile, investment in emission reduction projects facilitates the reduction of excess emission quotas through emission credits accrued from these investments. Consequently, emission balancing mechanisms (carbon offsets) stemming from carbon trading and project investments have the potential to curtail a company's overall annual emissions while fostering enduring stakeholder value (Kim and Kim, 2022).

Hoffmann (2007), drawing from data sourced from electricity companies in Germany, discerned that carbon trading stimulates research and development endeavors pertinent to emission reduction, fosters investment in carbon capture and storage (CCS) technologies capable of slashing emissions from fossil energy sources by 90%, and propels investment in low-emission portfolios. Correspondingly, Gao et al. (2020) and Zhang et al. (2020) unearthed that carbon trading mechanisms in China exert a substantial influence in diminishing emissions production and consumption from industries by up to 24%. Conversely, Trabucco et al. (2008) and Van der Gaast et al. (2018) unveiled that reforestation projects, coupled with hydrological cycle analyses, have the potential to amplify carbon storage capacity and contribute to climate change mitigation. Meanwhile, in developing nations such as Indonesia, green development mechanisms comprising peatland restoration, rainforest biodiversity conservation, and the establishment of hydropower and geothermal power plants can curtail industrial carbon emissions by 10.1 thousand tons (Katadata Insight Center, 2022). Hence, the hypothesis posited in this study stands as follows:

H1a: Carbon compensation strategies exert a positive influence on carbon performance.

2.3.3. Carbon reduction strategy and carbon performance

In accordance with stakeholder theory, carbon reduction strategies are regarded as mechanisms of resilience aimed at bolstering environmental performance through innovative approaches in both processes and products (Kolk and Pinkse, 2007; Sprengel and Busch, 2011). Utilization of eco-friendly technologies in production processes has been identified as a means to enhance energy efficiency within companies (Kolk and Pinkse, 2005).

Eco-friendly technologies operate by sequestering carbon emissions, thereby preventing their release into the atmosphere (Hasanbeigi et al., 2012) and optimizing fuel combustion derived from fossil energy sources (Kozarcanin et al., 2020; Oliver, 2008). Furthermore, investments directed towards low-emission energy sources, accomplished through substituting fossil fuels with alternative counterparts, have been demonstrated to enhance combustion efficiency (Song and Lee, 2010; Wang et al., 2016; Yunus et al., 2016).

Concomitantly, product enhancements facilitated by the substitution of high-emission raw materials with recycled alternatives offer avenues for reducing emissions throughout the entirety of a company's value chain (Couth and Trois, 2010; Muthu et al., 2012). For instance, Hasanbeigi et al. (2012) have observed that cement companies adopting shale oil or materials characterized by low limestone saturation factors yield environmentally safer products. Similarly, automotive enterprises strive to develop eco-friendly products that conform to established quality standards, thereby mitigating emissions stemming from product usage (Moriarty and Honnery, 2008).

Empirical findings from Wahyuni and Ratnatunga (2015) have revealed that companies transitioning from coal to gas fuel sources as part of their reduction strategies may effectuate a reduction in carbon emissions by approximately 50%. Notably, Haque and Ntim's (2022) investigation underscored that companies embracing carbon reduction strategies through sustainability initiatives pertaining to emissions, waste management, and the introduction of green products outperform their counterparts in terms of environmental performance. Furthermore, it was discerned that reduction strategies furnish enduring value to stakeholders (Choi and Luo, 2021). Consequently, the hypothesis posited in this study is as follows:

H1b: Carbon reduction strategies positively influence carbon performance.

2.3.4. Carbon independence strategy and carbon performance

Stakeholder theory perceives carbon independence strategies as enduring adaptation mechanisms to climate change risks, capable of engendering fresh business prospects to bolster company performance (Weinhofer and Hoffmann, 2010). Companies embark on radical innovations to emancipate themselves from reliance on emission-producing energy sources (Hoffman, 2006; Kolk and Pinkse, 2004, 2007; Weinhofer and Hoffmann, 2010). As a result, firms implementing carbon independence strategies can cultivate competitive advantages through the development of distinctive products (Boiral, 2006).

In the pursuit of enhanced environmental performance, carbon independence strategies entail investments in renewable technologies and the creation of emission-free products (Weinhofer and Hoffmann, 2010). During operational endeavors, companies necessitate energy to fuel their processes (electricity). With increased production, the demand for energy escalates correspondingly. Consequently, in the absence of emission-free energy sources, companies generate noteworthy greenhouse gas emissions (carbon, nitrogen, and sulfur). Herein lies the pivotal role of renewable energy in furnishing electricity supply without augmenting emission levels.

Concerning emission-free products, companies opt to substitute emission-inducing raw material supplies (such as plastic or iron) with wood materials, thus mitigating emissions from these products (Cadez and Czerny, 2016). Hasanbeigi et al. (2012) observed that within the manufacturing sector, companies utilize carbide slag as a non-carbon raw material in cement production.

Research outcomes by Wahyuni and Ratnatunga (2015) disclosed that electricity companies in Australia transitioned their technologies by investing in hydroelectric power plants to mitigate the uncertainties posed by regulations and market demands. Through this proactive stance, companies effectively managed their annual emission levels and successfully attained emission reduction objectives. Meanwhile, Lee and Min (2015) uncovered that when companies concentrate their resources on sustainable product and production process innovations, carbon emissions decrease, thereby advancing climate change mitigation efforts. Consequently, the hypothesis posited in this study is as follows:

H1c: Carbon independence strategies exert a positive influence on carbon performance.

2.3.5. Political connection and carbon performance

Based on the theory of resource dependence, companies with access to resources can reduce their dependence on external parties (Hillman et al., 2009; Salancik and Pfeffer, 1978). When companies are able to reduce their dependence, their performance improves. In the case of climate change, this theory views political connections as a channel to acquire resources provided by stakeholders to promote climate change mitigation actions (Xiao and Shen, 2022; Zeng and Lin, 2015).

Addressing climate change by reducing emissions requires investment in capital, human resources, raw materials, and technology. Therefore, companies need resources to drive operations towards sustainability. On the other hand, governments, as key stakeholders, have resources to promote mitigation actions through incentives, subsidies, green funding, and other environmental policies (Wang et al., 2018). Companies with superior performance typically receive resources, but in practice, there are several factors that can affect resource allocation, one of which is political connections (Faccio, 2006). Companies will use political connections to alter external conditions (in this case, resource allocation for climate change) to outperform those without political connections (Davis and Cobb, 2010; Hillman et al., 2009). When resource access is obtained, companies with political connections will be more aware of environmental issues and can reduce carbon emissions (Zeng and Lin, 2015).

Research findings (Zeng and Lin, 2015) suggest that political connections enable companies to obtain green subsidies, thereby enhancing environmental protection and sustainability actions. Meanwhile, political connections can drive mitigation actions through investment and innovation in environmentally friendly processes (Wang et al., 2022; Wang et al., 2018). On the other hand, companies with political connections receive special treatment by paying lower pollution levies and gaining access to carbon trading (Liu et al., 2020; Maung et al., 2016). Thus, the hypothesis in this study is as follows:

H2: Political connections have a positive influence on carbon performance

3. METHODOLOGY

3.1. Data Sources and Sample

In analyzing carbon performance, this study focuses on several company sectors sensitive to emissions such as energy, transportation, raw materials, industry, infrastructure, and agriculture. These six sectors were selected based on data from the Ministry of Environment and Forestry, which identified them as the largest contributors to carbon emissions in Indonesia. Furthermore, the observation period chosen spans from 2016 to 2022. The selection of this observation period is attributed to the effective implementation of emission policies in Indonesia during this timeframe. Employing sample selection criteria such as companies reporting financial, annual, and sustainability reports, and possessing carbon emission data, a final sample of 192 firm-year observations was identified. Research data were obtained manually by sourcing carbon performance and carbon strategy information from sustainability reports, while information regarding political connections was derived from annual company reports.

3.2. Measurement of Variables

3.2.1. Carbon performance

The dependent variable in this study is carbon performance, defined as the quantitative measure of climate change-causing emissions generated within one annual operating period of a company's business operations. More specifically, carbon performance is measured by expanding carbon intensity from Haque and Ntim (2022). The research encompasses all carbon emissions, including direct emissions (scope 1), indirect emissions (scope 2), and other indirect emissions (scope 3), obtained from company sustainability reports. Carbon intensity depicts the actual performance of carbon emissions generated from a company's business operations within 1 year (Hoffmann and Busch, 2008). Thus, the formula for calculating carbon performance is as follows:

$$\text{Carbon performance} = \frac{\begin{array}{c}\text{Log Carbon Emissions}\\ \text{(Scope1, Scope2 \& Scope3)}\end{array}}{\text{Log Total Revenue}} \quad (1)$$

3.2.2. Carbon strategy

Carbon strategy is a series of emission management actions undertaken to address climate change risks (Hoffman, 2006; Jeswani et al., 2008; Kolk and Pinkse, 2004). This study adopts the carbon strategy framework proposed by Weinhofer and Hoffmann (2010), which comprises carbon compensation, carbon reduction, and carbon independence. The carbon strategy is measured by summing the total value of indicators for carbon compensation, carbon reduction, and carbon independence strategies (Table 1) (Linares-Rodríguez et al., 2022). Thus, the carbon strategy score ranges from 0 to 6.

3.2.3. Carbon compensation strategy

Carbon compensation strategy is one type of carbon strategy aimed at reducing carbon emissions through carbon trading mechanisms (Jeswani et al., 2008). The compensation strategy is measured by two indicators: carbon trading and carbon offsetting projects. Carbon trading is a mechanism that allows companies to buy and sell carbon emissions according to government regulations (Sun et al., 2021). Meanwhile, carbon offsetting involves compensating for carbon emissions by financing projects to absorb these emissions (Sun et al., 2021). Emission reduction projects such as tree planting or reforestation of former operational lands can be

Table 1: Carbon strategy

Indicator	Criteria	Score
Carbon compensation strategy		
Carbon trading	Company do not participate in carbon trading	0
	Participate in carbon trading	1
Carbon offset project	Company do not participate in carbon offset project	0
	Participate in carbon offset project	1
Carbon reduction strategy		
Low-emission process	Company do not implement low carbon process	0
	Implement low carbon process	1
Low-emission product	Company do not implement low carbon product	0
	Implement low carbon product	1
Carbon independence strategy		
Emission-free process	Company do not invest in renewable technology	0
	Invest in renewable technology	1
Emission-free product	Company do not make replacement to emission-free product	0
	Make replacement to emission-free product	1

Sources: Linares-Rodríguez et al. (2022); Weinhofer and Hoffmann (2010); Yunus et al. (2016)

conducted internally or externally by the company. The scoring for carbon compensation by assigning a value of 0 if no compensation indicators are present, and 1 if compensation indicators are implemented, resulting in a carbon compensation strategy score ranging from 0 to 2.

3.2.4. Carbon reduction strategy

The carbon reduction strategy focuses on improving processes and products within companies (Boiral, 2006; Weinhofer and Hoffmann, 2010). This strategy is measured using two indicators: the enhancement of low-carbon processes or products. The low-carbon process indicator can be further clarified through several best practices implemented by companies, such as substituting oil energy with gas, utilizing better boilers for heating, integrating heating machines and power generators, employing technology to reduce emissions, and minimizing the use of cooling or heating when not during working hours (Yunus et al., 2016). Meanwhile, for low-carbon products, it can be observed through the use of recyclable raw materials in the production process or by engaging suppliers with eco-friendly attributes (Yunus et al., 2016). The scoring for carbon reduction by assigning a value of 0 if no reduction indicators are present, and 1 if reduction indicators are implemented, resulting in a carbon reduction strategy score ranging from 0 to 2.

3.2.5. Carbon independence strategy

The carbon independence strategy entails corporate carbon activities that explore new opportunities in the climate of climate change (Lee, 2012). This strategy is measured using two indicators: The enhancement of carbon-free processes or products. Several best practices of this strategy include the utilization of renewable technologies (solar, geothermal, wind, or water) to create emission-free production processes or replacing carbon-based products with non-carbon materials (e.g., substituting plastic with wood) (Yunus et al., 2016). The scoring for carbon independence by assigning a value of 0 if no self-reliance indicators are present, and 1 if self-reliance indicators are implemented, resulting in a carbon self-reliance strategy score ranging from 0 to 2.

3.2.6. Political connection

The political connection in this study represents the relationship between companies and the government, manifested by the presence of strategic company members holding positions within the government or military (Habib et al., 2017). The measurement of political connection in this study employs two groups of indicators: The first group consists of board members with political connections to individuals holding active government positions, while the second group includes board members with a history of involvement in governmental roles. The indicators used are modifications of the political connection measurement model proposed by Habib et al. (2017), Al-Hadi et al. (2017), and Tao et al. (2017). Determination of a company's political connection considers the following factors: (1) Scored as 0 if no political connection is present, (2) Scored as 1 if board members or directors have a work history in political parties, government, governmental agencies, the military, or the police, or have family ties to former politicians, government officials, governmental agencies, the military, or the police, and (3) Scored as 2 if board members or directors are currently serving in political parties, government, governmental agencies, the military, or the police, or have family ties to individuals currently holding positions in political parties, government, governmental agencies, the military, or the police.

3.2.7. Control variables

This study employs control variables related to company characteristics, namely leverage, firm size, profitability, and property investment. The use of control variables is based on several considerations as follows. (1) Leverage (LEV_{It}) is measured using the ratio of total debt to total assets in year t. This ratio assesses the company's debt capacity, with high debt leading to financial constraints for mitigation actions (Barnea and Rubin, 2010; Luo et al., 2013). (2) Firm size ($SIZE_{It}$) is measured using the logarithm of total assets in year t. Larger companies tend to emit more, which can negatively affect climate change. However, larger companies are also more likely to be subject to climate change regulations (McGuire et al., 2003) and are under close scrutiny by stakeholders or the media, thus having better standards and systems for reducing carbon emissions (Bewley and Li, 2000; Brouwers et al., 2018). (3) Profitability (ROA_{it}) is measured using the ratio of net income to total assets in year t. Companies with high profitability are more likely to afford costs associated with environmental compliance and investment in mitigation actions (De Villiers et al., 2011; Trinks et al., 2020; Velte et al., 2020). (4) Asset Investment ($CAPS_{it}$) is measured using the ratio of land, buildings, and structures to total assets. Companies with high investments in assets tend to have better environmentally friendly technologies. The use of leverage, firm size, profitability, and property investment as control variables has been conducted in previous studies such as Choi and Luo (2021), Datt et al. (2019), Haque and Ntim (2022), and Luo and Tang (2020).

3.3. Empirical Model

The panel data regression model is employed to test the research hypotheses. Following the Hausman test by comparing the fixed effect and random effect models, the testing results indicate that the fixed effect is the most suitable regression model for predicting the relationship between carbon strategy, political connections, and carbon performance. The following is the panel data regression model for each hypothesis:

Model 1

$$CPit = \beta 0 + \beta 1CSit + \beta 2PCit + \beta 3LEVit + \beta 4SIZEit + \beta 5ROAit + \beta 6CAPSit + \varepsilon it \quad (2)$$

Model 2

$$CPit = \beta 0 + \beta 7CCSit + \beta 8CRSit + \beta 9CISit + \beta 10PCit + \beta 11LEVit + \beta 12SIZEit + \beta 13ROAit + \beta 14CAPSit + \varepsilon it \quad (3)$$

Where CP = carbon performance; CS = carbon strategy; CCS = carbon compensation strategy; CRS = carbon reduction strategy; CIS = carbon independence strategy; PC = political connections; LEV = leverage; Size = company size; ROA = profitability; CAPS = asset investment. Model 1 examines the direct relationship between overall carbon strategy and political connections with carbon performance. Model 2 tests the relationship of each type of carbon strategy with carbon performance.

4. RESULTS

4.1. Descriptive Analysis

Based on the results of the descriptive analysis in Table 2, the distribution of carbon performance values is generally similar across all samples, although there are some companies in the energy sector with high emission intensity values. Interestingly, companies' attention to reporting carbon emission levels continues to grow each year, particularly evident in the focus observed over the past 2 years. Regarding carbon strategies, the descriptive findings indicate that companies in Indonesia generally implement two types of strategies as emission mitigation measures: compensation and reduction strategies. Furthermore, the results also show that the number of politically connected employees in the research sample exhibits high variability, with government-owned companies dominating high political connection scores.

4.2. Regression Analysis

The hypothesis testing based on model 1 and 2 are shown in Table 3. The results in model 1 indicate a significant F-statistic value at $\alpha = 0.05$, suggesting that the formed regression model meets the goodness of fit criteria or is suitable for predicting the relationship between carbon strategy and political connection with carbon performance. The hypothesis testing results show a significant probability value for carbon strategy at $\alpha = 0.05$ ($P = 0.001$) with a negative regression coefficient direction (−0.153). Meanwhile, the testing results for political connection show a significant probability value at $\alpha = 0.05$ ($P = 0.004$) with a positive regression coefficient direction (0.009). Testing in model 2 also shows consistent results with a significant probability value for political connection at $\alpha = 0.05$ ($P = 0.010$) with a positive regression coefficient direction (0.008). These findings indicate that carbon strategy can enhance carbon performance, but political connections weaken carbon performance in Indonesian companies, thus supporting hypothesis H1 and rejecting H2.

Furthermore, the hypothesis testing results in model 2 show a significant F-statistic value at $\alpha = 0.05$, indicating that the formed regression model meets the goodness of fit criteria or is suitable for predicting the relationship between compensation strategy, reduction strategy, and self-reliance strategy with carbon performance. The hypothesis testing results indicate a significant probability value for carbon compensation strategy at $\alpha = 0.05$ ($P = 0.012$) with a negative regression coefficient direction (−0.031). The probability value for carbon reduction strategy is significant at $\alpha = 0.05$ ($P = 0.028$) with a negative regression coefficient direction (−0.017), while the probability value for carbon self-reliance strategy is not significant at $\alpha = 0.05$ ($P = 0.355$) with a negative regression coefficient direction (−0.007). The findings indicate that the types of strategies that can enhance

Table 2: Descriptive statistics

Variable	Observation	Mean	Std deviation	Minimum	Maximum
Dependent variable					
CP	192	0.408868	0.097365	0.177136	0.646497
Independent variable					
CS	192	3.296875	1.414358	0	5
PC	192	2.302083	2.591245	0	12
CCS	192	0.838541	0.368915	0	1
CRS	192	1.395833	0.730476	0	2
CIS	192	1.046875	0.787926	0	2
Control variable					
ROA	192	0.048842	0.09105	−0.11767	0.5852
SIZE	192	13.13275	0.621993	11.18274	14.22695
LEV	192	0.48799	0.226515	0.006817	1.897679
CAPS	192	0.326291	0.273331	0.000001	0.894523

Carbon emission trends							
	2016	2017	2018	2019	2020	2021	2022
Carbon emission	7	9	12	23	32	56	55

CP: Carbon performance, CS: Carbon strategy, CCS: Carbon compensation strategy, CRS: Carbon reduction strategy, CIS: Carbon self-reliance strategy, PC: Political connection, ROA: Profitability, Size: Company size, LEV: Leverage, CAPS: Asset investment

Table 3: Hypothesis testing

Variable	Model 1		Model 2		Expected sign
	Coefficient	P-value	Coefficient	P-value	
CS	−0.153	0.001***			-
PC	0.009	0.004***	0.008	0.010***	-
CCS			−0.031	0.012***	-
CRS			−0.017	0.028**	-
CIS			−0.007	0.355	-
ROA	−0.033	0.556	−0.024	0.666	
SIZE	0.005	0.890	0.000	0.991	
LEV	0.037	0.154	0.044	0.101	
CAPS	−0.204	0.006***	−0.203	0.006***	
R-squared	0.194		0.212		
Prop >f	0.00		0.00		
Observations	192		192		

***Significant $\alpha = 0.01$, **Significant $\alpha = 0.05$

carbon performance are carbon compensation strategy and carbon reduction strategy. Thus, it can be concluded that H1a and H1b are supported, while H1c is rejected.

The results of the control variable tests for all models indicate that profitability, company size, and leverage do not influence carbon performance, as all variables have probabilities above the significance level (P > 0.05). The results of the asset investment variable test show a probability value below the significance level (P < 0.05) with a negative coefficient direction. This finding indicates that company investments in technology, especially renewable technology, will enhance company carbon performance (resulting in emission reduction).

The coefficient of determination test results with R-squared values show 0.19 for model 1 and 0.21 for model 2. Hair et al. (2019: 780) state that the goodness of fit of the coefficient of determination should be interpreted within the context of the research being conducted. Therefore, considering the R-squared values from previous studies such as Haque and Ntim (2022) and Linares-Rodríguez et al. (2022) (R-squared 11-17%), the R-squared values in this study are still considered satisfactory.

4.3. Additional Analysis

Additional analysis were undertaken to assess the robustness of the primary research outcomes. The aim was to ascertain the congruence between these additional tests and the primary findings. This supplementary examination was conducted in two stages: Initially, the carbon performance proxy was substituted with an alternative indicator, followed by a subsequent regression analysis; subsequently, regression analysis was executed after segmenting the research sample into categories of highly polluted sectors (energy, raw materials, utilities, and transportation) and less polluted sectors (infrastructure, agriculture, and industry).

The fixed-effect model was utilized to estimate the relationships among the independent, interaction, and dependent variables across all supplementary analysis models. Table 4 present the robustness analysis by using logarithm of carbon emission as an alternative indicator of carbon performance. The test results from model 1 indicate significant probability values for carbon strategy at $\alpha = 0.05$ (P = 0.000), with a negative regression coefficient direction (−0.217). This finding aligns consistently with the outcomes of previous hypothesis testing. Moreover, the examination outcomes of political connections across all models also demonstrate consistent results with previous tests. Politically connected employees tend to decrease carbon performance in Indonesian companies (P > 0.05; positive influence direction).

The test results from model 2 reveal significant probability values for both carbon offsetting strategy and carbon reduction strategy at $\alpha = 0.05$ (P = 0.033; 0.0021) with negative regression coefficient directions (−0.312; −0.312). These findings are consistent with the results of the hypothesis testing. Thus, it is empirically evident that carbon strategies, carbon offsetting strategies, and carbon reduction strategies can enhance carbon performance in Indonesian companies.

The second additional analysis was conducted on 131 observations for the high-emission sample and 61 observations for the low-emission sample. High-emission classification pertains to industries contributing significantly to carbon emissions, often referred to as polluting industries, while low-emission classification is the converse. Table 5 presents the regression tests for high and low pollution industries.

The regression test results reveal that for polluted company objects, hypotheses H1, H1a, and H1b are supported (P = 0.005; 0.005; 0.057 < 0.05). These findings further strengthen previous results indicating that carbon strategies are effective internal mechanisms in enhancing carbon performance, particularly in polluting industries. The test results indicate a probability value of 0.029 for the political connection variable (P < 0.05) with a positive coefficient direction. This finding also supports previous results suggesting that employees with political connections tend to reduce carbon performance, especially in polluting companies. Meanwhile, carbon independence strategy was found to have no significant effect on carbon performance (P > 0.05). This result is consistent with several previous findings.

The results of additional analysis on low-emission industries, surprisingly found that H1, H1a, H1b, H1c, and H2 were not supported. These findings indicate that for companies with low emission levels, improving carbon performance may not be a primary focus. The initial expectation of the additional analysis, separating the research sample, was for the high-pollution sector

Table 4: Robustness checks

Variable	Model 1		Model 2	
	Coefficient	P-value	Coefficient	P-value
CS	−0.217	0.000***		
PC	0.125	0.002***	0.117	0.004***
CCS			−0.312	0.033**
CRS			−0.312	0.001***
CIS			−0.083	0.38
ROA	−0.175	0.794	−0.028	0.966
SIZE	0.435	0.342	0.316	0.494
LEV	0.169	0.591	0.256	0.422
CAPS	−2.699	0.003	−2.708	0.002
R-squared	0.234		0.252	
Prop >f	0.000		0.000	
Observations	192		192	

*** Significant α = 0.01, ** Significant α = 0.05

Table 5: Additional analysis

Variable	Model 1		Model 2	
Panel A high emission industries				
	Coefficient	P-value	Coefficient	P-value
CS	−0.018	0.005***		
PC	0.009	0.029**	0.008	0.035**
CCS			−0.059	0.005***
CRS			−0.018	0.057**
CIS			−0.009	0.323
ROA	−0.009	0.794	0.008	0.915
SIZE	−0.005	0.342	−0.003	0.955
LEV	0.036	0.591	0.042	0.196
CAPS	−0.27	0.003***	−0.251	0.022**
R-squared	0.207		0.251	
Prop >f	0.001		0.001	
Observations	131		131	
Panel B low emission industries				
CS	−0.004	0.179		
PC	0.015	0,.000***	0.014	0.001***
CCS			−0.005	0.418
CRS			−0.044	0.185
CIS			0.015	0.351
ROA	−0.059	0.202	−0.077	0.119
SIZE	−0.019	0.433	0.010	0.777
LEV	0.068	0.040**	0.068	0.049**
CAPS	−0.081	0.100	−0.059	0.257
R-squared	0.405		0.432	
Prop >f	0.003		0.007	
Observations	61		61	

*** Significant α = 0.01, ** Significant α = 0.05

test results to be consistent with the main research findings, while the low-pollution sector results were inconsistent.

5. DISCUSSION

This study analyzes the relationship between carbon strategies, dimensions of carbon strategy, and political connections on carbon performance. The hypothesis testing results conclude that carbon strategies have a negative impact on carbon performance, meaning that the more types of carbon strategies implemented by companies, the lower the carbon emissions intensity of the company. Carbon strategies in this study depict the mitigation steps taken by companies to reduce emissions throughout their supply chains.

Carbon strategy involves innovation processes, mindset changes, and investments in green technology. Carbon offsetting through tree planting projects forces companies to trade off excess carbon emissions (Zhang et al., 2020). Companies switch to environmentally friendly materials to reduce carbon emissions generated in the production process (Cadez and Czerny, 2016). Investments in environmentally friendly technology lead to fuel efficiency and the creation of emission-free energy sources (Hasanbeigi et al., 2012). Sustainable lifestyles result in energy savings, and equipment maintenance enhances combustion efficiency (Cadez and Czerny, 2016). The combination of mitigation measures leads to a significant reduction in emissions from company operations, production, and value chains (Lee, 2012).

Carbon strategies have been proven to have a positive impact on a company's carbon performance. This finding aligns with the reality and climate change conditions in Indonesia. The government's demand for improved corporate performance is high, given the vision of Net Zero Emissions. As a key stakeholder in climate change, the government has issued Carbon Economic Value regulations outlining steps and emission reduction targets to be achieved. Therefore, regulated sectors strive to improve their business processes by implementing environmentally friendly strategies.

The greenhouse gas inventory program issued by the government is also beneficial for industries. This program calculates emissions from each company and serves as a basis for sustainable changes. Through this program, high-emission industrial sectors become aware and immediately take mitigation actions.

The research findings are consistent with those of Linares-Rodríguez et al. (2022), stating that the Colombian government is pressuring companies to implement low-emission strategies. Furthermore, the regulations promote emission reduction measures, focusing directly on sectors prioritized for emission reduction. Bui et al. (2022) also found similar results; proactive carbon strategies have an effect on reducing carbon emission intensity, while reactive strategies have an effect on increasing carbon savings. On the other hand, the research findings do not align with those of Damert et al. (2017), who found that carbon strategies were unable to improve carbon performance. Unlike Damert et al. (2017), who analyzed one dimension of carbon strategy, this study combines various carbon strategies—compensation, reduction, and independence—thus resulting in improved performance.

This research separately examines the relationship between each type of carbon strategy and carbon performance. The results show that carbon offset strategies have a negative impact on carbon performance, meaning that the higher the implementation of offset strategies, the lower the carbon emissions intensity of the company. Based on additional analysis by separating the samples, the test results for high-emission industries are consistent and have higher coefficients of determination and regression than the main test. These findings indicate that high-emission industries are already very aware of the need to reduce emissions, prompting companies to take quick action by compensating for their excess emissions. Carbon offset strategies involve the transfer of resources, both financial and technological, playing a crucial role in driving corporate awareness to address climate change in the short term (Fuhr and Lederer, 2009). Therefore, the carbon offset mechanism from compensation strategies works well in reducing excess emissions.

The success of carbon offset strategies in improving a company's carbon performance cannot be separated from the government's influence as an environmental issue regulator. Before the world was alarmed by the threat of climate change, Indonesia had experienced massive environmental exploitation issues for a long time. Consequently, the government formulated several regulations to control corporate behavior, such as Law Number 32 of 2009 concerning Environmental Protection and Management; Ministerial Regulation Number P.41 of 2013 concerning Tree Planting. Thus, there is already a culture within Indonesian companies to undertake social and environmental responsibility actions, such as reforesting operational land and creating new forest ecosystems after land excavation. In 2007, the government required companies to publicly implement social responsibilities, with the hope of balancing economic, environmental, and social goals (Waagstein, 2011). Hidayati (2011) found that as a form of social responsibility, Indonesian companies reduce the adverse impacts of their operations on the environment through the implementation of green strategies, processes, and products.

Furthermore, the Paris Agreement allows Indonesia to develop its own emission reduction mechanisms. Generally, emission reduction projects undertaken by companies in Indonesia are voluntary; companies either restore forest land privately or invest in projects with emission reduction certificates. According to investigations by the Katadata Insight Center (2022), there are 13 emission reduction projects involving forest land restoration and investment in renewable energy registered with carbon verification agencies. Since the implementation of the Paris Agreement, 215 emission reduction projects have been carried out. Nijni and Halder (2013) found in their research that Indonesia is one of the countries in the Asia-Pacific region with a high level of interest in investing in land restoration projects. Thus, although still in its early stages, the climate of trade and investment in green projects has been established and is functioning well in Indonesia.

The research also found that the implementation of carbon reduction strategies can enhance a company's carbon performance. When companies integrate emission reduction targets into their business objectives, it drives innovation processes leading to improved sustainability performance (Le, 2022). The innovation dimension inherent in reduction strategies creates differentiation in production processes and leads companies to improve environmental performance and competitive advantage (Ong et al., 2019).

In Indonesia, carbon reduction strategies are an integral part of Corporate Social Responsibility (CSR) activities. A case study by Hidayati (2011) found that even before the demand for mitigation actions, companies in Indonesia had implemented green strategies, processes, products, and green employees as the core of CSR activities. Companies integrate CSR activities with environmental strategies, creating a condition of interdependence between companies and communities. Ultimately, the implementation of sustainable activities in Indonesia aims to promote sustainability performance, enhance reputation, serve as a tangible manifestation of ethical business management, and serve as a legitimization tool for stakeholders (Hidayati, 2011). The established CSR activities cause companies to increase and expand their environmental strategies by incorporating climate change issues as new targets in business management.

Meanwhile, the test results found an unusual relationship between political connections and carbon performance. The more employees politically connected within a company, the worse the carbon emission performance. Several possibilities can explain this finding. Firstly, this phenomenon is closely related to rent-seeking behavior. Companies may use politically connected employees to reduce environmental rule risks because they have special relationships with the government; even if they violate regulations, companies can escape severe environmental sanctions and may choose environmental rules that benefit their conditions (Chen et al., 2017; Faccio, 2006). Consistent with this phenomenon, Maung et al. (2016) found that companies would use politically connected employees to lower the risk of environmental sanctions from the government. Secondly, the turnover of politically connected employees can prevent companies from achieving their environmental goals. The replacement of politically connected employees will have different effects on emission intensity (Xie et al., 2023). Politically connected employees take time to build organizational culture, thus slowing compliance with environmental regulations.

6. CONCLUSION

This study focuses on the issues arising from the relationship between carbon mitigation strategies and political connections on carbon performance, as well as the carbon governance mechanisms in polluting companies in Indonesia. The sample in this study consists of companies in the energy, transportation, raw materials, industrial, infrastructure, and agricultural sectors from 2016 to 2022.

The research findings indicate that: First, combining various types of carbon strategies in business leads to an improvement in company carbon performance. This finding demonstrates that, in response to the demand for environmental performance improvement, particularly in carbon emissions, companies must implement various strategic measures and integrate them into their business operations. Second, compensation strategies can enhance carbon performance. It is crucial for companies to engage in land restoration projects and tree planting to reduce excess emissions produced. Third, reduction strategies can improve carbon performance. Companies need to improve and change business processes to create low-emission production systems. Consequently, companies can reduce emissions throughout their value chains. Fourth, self-reliance strategies cannot enhance carbon performance. Indonesian companies exhibit symbolic behavior by legitimizing their sustainability actions at a level mandated by regulations, thus failing to create radical innovations by investing in renewable technologies. Fifth, political connections can reduce carbon performance. Companies may use politically connected employees to shield themselves from regulations and avoid government sanctions. The research also found that highly polluting companies are becoming increasingly aware of environmental issues and are striving to reduce emissions through various innovative measures.

This study offers several policy and theoretical implications. First, it encourages companies in Indonesia to implement carbon strategies in their daily operations. Companies can adopt one type of carbon strategy or a combination of several strategies depending on their capabilities and business objectives. If a company's goal is to balance excess carbon emissions without changing its business processes, it can implement carbon offset strategies. Companies aiming to significantly reduce carbon emissions throughout their product value chains can adopt carbon reduction strategies. Companies can also combine both strategies to support better carbon performance. Second, companies need to evaluate the composition or proportion of boards and develop new policies for appointing politically connected boards. This policy is crucial to encourage green behavior among directors, thereby taking tangible steps to reduce carbon emissions. Third, theoretically, this study provides confirmation and explanation regarding the implementation of strategies and the appropriate types of strategies to respond to climate change demands using stakeholder theory. Furthermore, the study provides confirmation and explanation of companies' deviant behavior in using political connections as a strategy to avoid environmental sanctions due to excess carbon emissions using resource dependence theory.

This study has several limitations. First, the level of company participation in disclosing data related to carbon emissions remains low. Most companies do not consistently disclose emission data. This issue has only received attention in the last 2 years of the observation period, resulting in most samples having data for only 2021 and 2022. Second, researchers encountered difficulties in gathering information and identifying the types of carbon strategies implemented by companies. The lack of a framework or standard for disclosing mitigation actions makes it challenging to identify some carbon strategy data. Third, companies are sometimes inconsistent in disclosing strategy information in sustainability reports. Companies may disclose mitigation measures this year, but the information may not be available in subsequent years.

Based on the limitations identified, this study suggests future research development. First, future research opportunities may re-examine the determinants of carbon performance in non-financial sector companies in Indonesia by extending the observation period. Insignificant of strategy independence could be re-examined by expanding investments in renewable technologies. Future research could also predict the long-term effects of self-reliance strategy implementation or incorporate factors that can control strategy implementation, such as governance. Second, future research needs to separate types of politically connected employees (e.g., active, retired, military personnel, or political party members) or examine the turnover of politically connected employees to provide broader exploration impacts.

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REFERENCES

Akbaş, H.E., Canikli, S. (2019), Determinants of voluntary greenhouse gas emission disclosure: An empirical investigation on Turkish firms. Sustainability, 11(1), 107.

Al-Hadi, A., Habib, A., Al-Yahyaee, K., Eulaiwi, B. (2017), Joint audit, political connections and cost of debt capital. International Journal of Auditing, 21(3), 249-270.

Barnea, A., Rubin, A. (2010), Corporate social responsibility as a conflict between shareholders. Journal of Business Ethics, 97(1), 71-86.

Benkraiem, R., Shuwaikh, F., Lakhal, F., Guizani, A. (2022), Carbon performance and firm value of the World's most sustainable companies. Economic Modelling, 116, 106002.

Berrone, P., Gomez-Mejia, L.R. (2009), Environmental performance and executive compensation: An integrated agency-institutional perspective. Academy of Management Journal, 52(1), 103-126.

Bewley, K., Li, Y. (2000), Disclosure of environmental information by Canadian manufacturing companies: A voluntary disclosure perspective. Advances in Environmental Accounting and Management, 1, 201-226.

Boiral, O. (2006), Global warming: Should companies adopt a proactive strategy? Long Range Planning, 39(3), 315-330.

Branco, M.C., Rodrigues, L.L. (2007), Positioning stakeholder theory within the debate on corporate social responsibility. Electronic Journal of Business Ethics and Organization Studies, 12(1), 5-15.

Brouwers, R., Schoubben, F., Van Hulle, C. (2018), The influence of carbon cost pass through on the link between carbon emission and corporate financial performance in the context of the European Union Emission Trading Scheme. Business Strategy and the Environment, 27(8), 1422-1436.

Bui, B., Houqe, M.N., Zahir-ul-Hassan, M.K. (2022), Moderating effect of carbon accounting systems on strategy and carbon performance: A CDP analysis. Journal of Management Control, 33(4), 483-524.

Busch, T., Hoffmann, V.H. (2007), Emerging carbon constraints for corporate risk management. Ecological Economics, 62(3-4), 518-528.

Busch, T., Hoffmann, V.H. (2011), How hot is your bottom line? linking carbon and financial performance. Business and Society, 50(2), 233-265.

Cadez, S., Czerny, A. (2016), Climate change mitigation strategies in carbon-intensive firms. Journal of Cleaner Production, 112, 4132-4143.

Cadez, S., Czerny, A., Letmathe, P. (2019), Stakeholder pressures and corporate climate change mitigation strategies. Business Strategy and the Environment, 28(1), 1-14.

Cansino, J.M., Pablo-Romero, M.P., Román, R., Yñiguez, R. (2010), Tax incentives to promote green electricity: An overview of EU-27 countries. Energy Policy, 38(10), 6000-6008.

Choi, B., Luo, L. (2021), Does the market value greenhouse gas emissions? Evidence from multi-country firm data. British Accounting Review, 53(1), 100909.

Chen, C. R., Li, Y., Luo, D., & Zhang, T. (2017). Helping hands or grabbing hands? An analysis of political connections and firm value. Journal of Banking and Finance, 80, 71-89.

Couth, R., Trois, C. (2010), Carbon emissions reduction strategies in Africa from improved waste management: A review. Waste Management, 30(11), 2336-2346.

Damert, M., Paul, A., Baumgartner, R.J. (2017), Exploring the determinants and long-term performance outcomes of corporate carbon strategies. Journal of Cleaner Production, 160, 123-138.

Datt, R.R., Luo, L., Tang, Q. (2019), Corporate voluntary carbon disclosure strategy and carbon performance in the USA. Accounting Research Journal, 32(3), 417-435.

Davis, G.F., Cobb, J.A. (2010), Chapter 2: Resource dependence theory: Past and future. In: Research in the Sociology of Organizations. Vol. 28. Amsterdam: Elsevier.

De Villiers, C., Naiker, V., van Staden, C.J. (2011), The effect of board characteristics on firm environmental performance. Journal of Management, 37(6), 1636-1663.

Deegan, C. (2002), Introduction: The legitimising effect of social and environmental disclosures - A theoretical foundation. Accounting, Auditing and Accountability Journal, 15(3), 282-311.

Desheng, L., Jiakui, C., Ning, Z. (2021), Political connections and green technology innovations under an environmental regulation. Journal of Cleaner Production, 298, 126778.

Elsayih, J., Tang, Q., Lan, Y.C. (2018), Corporate Governance and carbon transparency: Australian experience. Accounting Research Journal, 31(3), 405-422.

Faccio, M. (2006), Politically connected firms. American Economic Review, 96(1), 369-386.

Firmansyah, A., Arham, A., Qadri, R.A., Wibowo, P., Irawan, F., Kustiani, N.A., Wijaya, S., Andriani, A.F., Arfiansyah, Z., Kurniawati, L., Mabrur, A., Dinarjito, A., Kusumawati, R., Mahrus, M.L (2022), Political connections, investment opportunity sets, tax avoidance: Does corporate social responsibility disclosure in Indonesia have a role ? Heliyon, 8, e10155.

Freeman, R.E. (1984), Strategic Management: A Stakeholder Approach. Boston: Pitman.

Freeman, R.E. (2015), Stakeholder Theory. In: Wiley Encyclopedia of Management. Hoboken: John Wiley and Sons, Ltd. p1-6.

Fuhr, H., & Lederer, M. (2009). Varieties of carbon governance in newly industrializing countries. Journal of Environment and Development, 18(4), 327–345.

Gao, Y., Li, M., Xue, J., Liu, Y. (2020), Evaluation of effectiveness of China's carbon emissions trading scheme in carbon mitigation. Energy Economics, 90, 104872.

Goldman, E., Rocholl, J., So, J. (2013), Politically connected boards of directors and the allocation of procurement contracts. Review of Finance, 17(5), 1617-1648.

Habib, A., Muhammadi, A.H., Jiang, H. (2017), Political connections and related party transactions: Evidence from Indonesia. The International Journal of Accounting, 52(1), 45-63.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate Data Analysis. https://doi.org/10.1002/9781119409137.ch4

Haque, F. (2017), The effects of board characteristics and sustainable compensation policy on carbon performance of UK firms. British Accounting Review, 49(3), 347-364.

Haque, F., Ntim, C.G. (2022), Do corporate sustainability initiatives improve corporate carbon performance? Evidence from European firms. Business Strategy and the Environment, 31, 3318-3334.

Hart, S.L. (1995), A natural-resource-based view of the firm. Academy of Management Journal, 20(4), 986-1014.

Hasanbeigi, A., Price, L., Lin, E. (2012), Emerging energy-efficiency and CO_2 emission-reduction technologies for cement and concrete production: A technical review. Renewable and Sustainable Energy Reviews, 16(8), 6220-6238.

Hidayati, N. D. (2011). Pattern of corporate social responsibility programs: A case study. Social Responsibility Journal, 7(1), 104–117.

Hillman, A.J., Withers, M.C., Collins, B.J. (2009), Resource dependence theory: A review. Journal of Management, 35(6), 1404-1427.

Hoffman, A.J. (2006), Getting Ahead of the Curve: Corporate Strategies that Address Climate Change. Arlington: Pew Center on Global Climate Change.

Hoffmann, V.H. (2007), EU ETS and investment decisions: The case of the German electricity industry. European Management Journal, 25(6), 464-474.

Hoffmann, V. H., & Busch, T. (2008). Corporate carbon performance indicators: Carbon intensity, dependency, exposure, and risk. Journal of Industrial Ecology, 12(4), 505-520.

Hörisch, J., Freeman, R.E., Schaltegger, S. (2014), Applying Stakeholder theory in sustainability management: Links, similarities, dissimilarities, and a conceptual framework. Organization and Environment, 27(4), 328-346.

Hörisch, J., Schaltegger, S., Freeman, R.E. (2020), Integrating Stakeholder theory and sustainability accounting: A conceptual synthesis. Journal of Cleaner Production, 275, 124097.

Houston, J.F., Jiang, L., Lin, C., Ma, Y. (2014), Political connections and the cost of bank loans. Journal of Accounting Research, 52(1), 193-243.

Huang, Y., Xue, L., Khan, Z. (2021), What abates carbon emissions in China: Examining the impact of renewable energy and green investment. Sustainable Development, 29(5), 823-834.

IPCC. (2023), Climate Change 2023 Synthesis Report. Geneva: IPCC.

Jaggi, B., Allini, A., Macchioni, R., Zampella, A. (2018), Do investors find carbon information useful? Evidence from Italian firms. Review of Quantitative Finance and Accounting, 50(4), 1031-1056.

Jeswani, H. K., Wehrmeyer, W., & Mulugetta, Y. (2008). How warm is the corporate responses to climate change? Evidence from Pakistan and the UK. Business Strategy and the Environment, 17(1), 46-60.

Jiang, W., Wang, X., Wu, X. (2022), Analysis of the impact of ecological innovation and green investment on China's CO_2 emissions. Journal of Environmental and Public Health, 2022, 3783985.

Johnson, M.P., Rötzel, T.S., Frank, B. (2023), Beyond conventional corporate responses to climate change towards deep decarbonization: A systematic literature. Management Review Quarterly, 73, 921-954.

Jonas, A.E.G., Gibbs, D., While, A. (2011), The new urban politics as a politics of carbon control. Urban Studies, 48(12), 2537-2554.

Kasbun, N.F., Ong, T.S., Muhamad, H., Said, R.M. (2019), Conceptual framework to improve carbon performance via carbon strategies and carbon accounting. Journal of Environmental Management and Tourism, 10(8), 1918-1923.

Katadata Insight Center. (2022), Indonesia Carbon Trading Handbook. Indonesia: Katadata Insight Center.

Khalil, M.A., Nimmanunta, K. (2021), Conventional versus green investments: Advancing innovation for better financial and environmental prospects. Journal of Sustainable Finance and Investment, 13, 1153-1180.

Khatri-Chhetri, A., Sapkota, T.B., Sander, B.O., Arango, J., Nelson, K.M., Wilkes, A. (2021), Financing climate change mitigation in agriculture: Assessment of investment cases. Environmental Research Letters, 16(12), 124044.

Kılıç, M., Kuzey, C. (2019), The effect of corporate governance on carbon emission disclosures: Evidence from Turkey. International Journal of Climate Change Strategies and Management, 11(1), 35-53.

Kim, S.A., Kim, J.D. (2022), Voluntary Carbon Disclosure (VCD) strategy under the Korean ETS: With the interaction among carbon performance, foreign sales ratio and media visibility. International

Journal of Environmental Research and Public Health, 19(18), 11268.
Kolk, A., Pinkse, J. (2004), Market strategies for climate change. European Management Journal, 22(3), 304-314.
Kolk, A., Pinkse, J. (2005), Business responses to climate change: Identifying emergent strategies. California Management Review, 47(3), 6-20.
Kolk, A., Pinkse, J. (2007), Towards strategic stakeholder management? Integrating perspectives on sustainability challenges such as corporate responses to climate change. Corporate Governance, 7(4), 370-378.
Kozarcanin, S., Hanna, R., Staffell, I., Gross, R., Andresen, G.B. (2020), Impact of climate change on the cost-optimal mix of decentralised heat pump and gas boiler technologies in Europe. Energy Policy, 140, 111386.
Kraus, S., Rehman, S.U., García, F.J.S. (2020), Corporate social responsibility and environmental performance: The mediating role of environmental strategy and green innovation. Technological Forecasting and Social Change, 160, 120262.
Le, T.T. (2022), How do corporate social responsibility and green innovation transform corporate green strategy into sustainable firm performance? Journal of Cleaner Production, 362, 132228.
Lee, K.H., Min, B. (2015), Green R&D for eco-innovation and its impact on carbon emissions and firm performance. Journal of Cleaner Production, 108, 534-542.
Lee, S. Y. (2012). Corporate carbon strategies in responding to climate change. Business Strategy and the Environment, 21(1), 33-48.
Li, D., Huang, M., Ren, S., Chen, X., Ning, L. (2018), Environmental legitimacy, green innovation, and corporate carbon disclosure: Evidence from CDP China 100. Journal of Business Ethics, 150(4), 1089-1104.
Li, Z.Z., Li, R.Y.M., Malik, M.Y., Murshed, M., Khan, Z., Umar, M. (2021), Determinants of carbon emission in China: How good is green investment? Sustainable Production and Consumption, 27, 392-401.
Linares-Rodríguez, M.C., Gambetta, N., García-Benau, M.A. (2022), Carbon management strategy effects on the disclosure and efficiency of carbon emissions: A study of Colombian companies' context and inherent characteristics. Journal of Cleaner Production, 365, 132850.
Liu, W., Yu, C., Cheng, S., Xu, J., Wu, Y. (2020), China's carbon emissions and trading pilot, political connection, and innovation input of publicly listed private firms. International Journal of Environmental Research and Public Health, 17(17), 6084.
Luo, L., Tang, Q. (2014), Does voluntary carbon disclosure reflect underlying carbon performance? Journal of Contemporary Accounting and Economics, 10(3), 191-205.
Luo, L., Tang, Q. (2020), Corporate governance and carbon performance: Role of carbon strategy and awareness of climate risk. Accounting and Finance, 61(2), 2891-2934.
Luo, L., Tang, Q., Yi-Cheni, L. (2013), Comparison of propensity for carbon disclosure between developing and developed countries. Accounting Research Journal, 26(1), 6-34.
Luo, X., Zhang, R., Liu, W. (2022), Environmental legitimacy pressure, political connection and impression management of carbon information disclosure. Carbon Management, 13(1), 90-104.
Mao, Z., Zhang, S., Li, X. (2017), Low carbon supply chain firm integration and firm performance in China. Journal of Cleaner Production, 153, 354-361.
Markandya, A., Ortiz, R.A., Mudgal, S., Tinetti, B. (2009), Analysis of tax incentives for energy-efficient durables in the EU. Energy Policy, 37(12), 5662-5674.
Matsumura, E.M., Prakash, R., Vera-Muñoz, S.C. (2014), Firm-value effects of carbon emissions and carbon disclosures. Accounting Review, 89(2), 695-724.
Maung, M., Wilson, C., Tang, X. (2016), Political connections and industrial pollution: Evidence based on state ownership and environmental levies in China. Journal of Business Ethics, 138(4), 649-659.
McGuire, J., Dow, S., Argheyd, K. (2003), CEO incentives and corporate social performance. Journal of Business Ethics, 45(4), 341-359.
Mcleod, E., Bruton-Adams, M., Förster, J., Franco, C., Gaines, G., Gorong, B., James, R., Posing-Kulwaum, G., Tara, M., Terk, E. (2019), Lessons from the pacific islands - Adapting to climate change by supporting social and ecological resilience. Frontiers in Marine Science, 6, 289.
Moriarty, P., Honnery, D. (2008), The prospects for global green car mobility. Journal of Cleaner Production, 16(16), 1717-1726.
Muthu, S.S.K., Li, Y., Hu, J.Y., Ze, L. (2012), Carbon footprint reduction in the textile process chain: Recycling of textile materials. Fibers and Polymers, 13(8), 1065-1070.
Nijnik, M., & Halder, P. (2013). Afforestation and reforestation projects in South and South-East Asia under the Clean Development Mechanism: Trends and development opportunities. Land Use Policy, 31, 504–515.
O'Donovan, G. (2002), Environmental disclosures in the annual report: Extending the applicability and predictive power of legitimacy theory. Accounting, Auditing and Accountability Journal, 15(3), 344-371.
Olatunji, O.O., Ayo, O.O., Akinlabi, S., Ishola, F., Madushele, N., Adedeji, P.A. (2019), Competitive advantage of carbon efficient supply chain in manufacturing industry. Journal of Cleaner Production, 238, 117937.
Olayeni, A., Ogbo, A., Okwo, H., Chukwu, B., Ifediora, C., Ezenwakwelu, C. (2021), Green strategy effect on financial and environmental performance: A mediation analysis of product quality. Sustainability, 13(4), 2115.
Oliver, T. (2008), Clean fossil-fuelled power generation. Energy Policy, 36(12), 4310-4316.
Olson, E. G. (2008). Creating an enterprise-level "green" strategy. Journal of Business Strategy, 29(2), 22-30.
Ong, T. S., Lee, A. S., Teh, B. H., & Magsi, H. B. (2019). Environmental innovation, environmental performance and financial performance: Evidence from Malaysian environmental proactive firms. Sustainability (Switzerland), 11(12), 1–18.
Pfeffer, J., Salancik, G.R. (2003), The External control of Organizations: A Resource Dependence Approach. New York: Harper and Row Publishers. p300.
Qian, W., Schaltegger, S. (2017), Revisiting carbon disclosure and performance: Legitimacy and management views. British Accounting Review, 49(4), 365-379.
Radu, C., Caron, M.A., Arroyo, P. (2020), Integration of carbon and environmental strategies within corporate disclosures. Journal of Cleaner Production, 244, 118681.
Ratmono, D., Darsono, D., Selviana, S. (2021), Effect of carbon performance, company characteristics and environmental performance on carbon emission disclosure: Evidence from Indonesia. International Journal of Energy Economics and Policy, 11(1), 101-109.
Roscoe, S., Subramanian, N., Jabbour, C.J.C., Chong, T. (2019), Green human resource management and the enablers of green organisational culture: Enhancing a firm's environmental performance for sustainable development. Business Strategy and the Environment, 28(5), 737-749.
Salancik, G.R., Pfeffer, J. (1978), A social information processing approach to job attitudes and task design. Administrative Science Quarterly, 23(2), 224-253.
Shen, Y., Su, Z.W., Malik, M.Y., Umar, M., Khan, Z., Khan, M. (2021),

Does green investment, financial development and natural resources rent limit carbon emissions? A provincial panel analysis of China. Science of the Total Environment, 755, 142538.

Singh, S.K., Del Giudice, M., Chierici, R., Graziano, D. (2020), Green innovation and environmental performance: The role of green transformational leadership and green human resource management. Technological Forecasting and Social Change, 150, 119762.

Song, J.S., Lee, K.M. (2010), Development of a low-carbon product design system based on embedded GHG emissions. Resources, Conservation and Recycling, 54(9), 547-556.

Sprengel, D.C., Busch, T. (2011), Stakeholder engagement and environmental strategy - The case of climate change. Business Strategy and the Environment, 20(6), 351-364.

Stechemesser, K., Guenther, E. (2012), Carbon accounting : A systematic literature review. Journal of Cleaner Production, 36, 17-38.

Sun, R., Zou, G. (2021), Political connection, CEO gender, and firm performance. Journal of Corporate Finance, 71, 101918.

Tao, Q., Sun, Y., Zhu, Y., Yang, X. (2017), Political connections and government subsidies: Evidence from financially distressed firms in China. Emerging Markets Finance and Trade, 53(8), 1854-1868.

Trabucco, A., Zomer, R.J., Bossio, D.A., van Straaten, O., Verchot, L.V. (2008), Climate change mitigation through afforestation/reforestation: A global analysis of hydrologic impacts with four case studies. Agriculture, Ecosystems and Environment, 126(1-2), 81-97.

Trinks, A., Mulder, M., Scholtens, B. (2020), An efficiency perspective on carbon emissions and financial performance. Ecological Economics, 175, 106632.

United Nations. (2015), United Nations-Resolution adopted by The General Assembly on 25 September 2015. Transforming our World: The 2030 Agenda for Sustainable Development. New York: United Nations.

Van der Gaast, W., Sikkema, R., Vohrer, M. (2018), The contribution of forest carbon credit projects to addressing the climate change challenge. Climate Policy, 18(1), 42-48.

Velte, P., Stawinoga, M., Lueg, R. (2020), Carbon performance and disclosure: A systematic review of governance-related determinants and financial consequences. Journal of Cleaner Production, 254, 120063.

Waagstein, P. R. (2011). The Mandatory Corporate Social Responsibility in Indonesia: Problems and Implications. Journal of Business Ethics, 98(3), 455–466.

Wahyuni, D., Ratnatunga, J. (2015), Carbon strategies and management practices in an uncertain carbonomic environment - Lessons learned from the coal-face. Journal of Cleaner Production, 96, 397-406.

Wang, B., Peng, C., Wu, J., Liao, F. (2022), The impact of political connections on corporate green innovation: The mediating effect of corporate social responsibility and the moderating effect of environmental public opinion. Sustainability, 14(8), 4708.

Wang, K., Zhang, H.M., Tsai, S.B., Wu, L.D., Xue, K.K., Fan, H.J., Zhou, J., Chen, Q. (2018), Does a board chairman's political connection affect green investment?-From a sustainable perspective. Sustainability, 10(3), 582.

Wang, Q., Zhao, D., He, L. (2016), Contracting emission reduction for supply chains considering market low-carbon preference. Journal of Cleaner Production, 120, 72-84.

Wang, Z., Fu, H., Ren, X. (2022), The impact of political connections on firm pollution: New evidence based on heterogeneous environmental regulation. Petroleum Science, 20, 636-647.

Weinhofer, G., Hoffmann, V.H. (2010), Mitigating climate change - How do corporate strategies differ? Business Strategy and the Environment, 19(2), 77-89.

Weng, Q., Xu, H. (2018), A review of China's carbon trading market. Renewable and Sustainable Energy Reviews, 91, 613-619.

Wong, W.Y., Hooy, C.W. (2018), Do types of political connection affect firm performance differently? Pacific Basin Finance Journal, 51, 297-317.

Xiao, G., Shen, S. (2022), To pollute or not to pollute: Political connections and corporate environmental performance. Journal of Corporate Finance, 74, 102214.

Xie, R., Zhang, J., & Tang, C. (2023). Political connection and water pollution: New evidence from Chinese listed firms. Resource and Energy Economics, 74(2662021), 101390.

Yunus, S., Elijido-Ten, E., Abhayawansa, S. (2016), Determinants of carbon management strategy adoption: Evidence from Australia's top 200 publicly listed firms. Managerial Auditing Journal, 31(2), 156-179.

Zeng, S.X., Lin, H., Ma, H.Y., Chen, H.Q. (2015), How political connections affect corporate environmental performance: The Mediating Role of Green Subsidies. Human and Ecological Risk Assessment: An International Journal, 21(8), 2192-2212.

Zhang, C., Zhao, Z., Wang, Q., Xu, B. (2022), Title: Holistic governance strategy to reduce carbon intensity. Technological Forecasting and Social Change, 179, 121600.

Zhang, W., Li, J., Li, G., Guo, S. (2020), Emission reduction effect and carbon market efficiency of carbon emissions trading policy in China. Energy, 196, 117117.

Zhang, X., Zhang, R., Zhao, M., Wang, Y., Chen, X. (2022), Policy orientation, technological innovation and energy-carbon performance: An empirical study based on China's new energy demonstration cities. Frontiers in Environmental Science, 10, 846742.

Zhao, X.G., Wu, L., Li, A. (2017), Research on the efficiency of carbon trading market in China. Renewable and Sustainable Energy Reviews, 79, 1-8.