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# Corporate Environmental Performance and Firm Value—Using Emission Metrics: An Empirical Study in India

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## Abstract

The study aims to examine and analyze the impact of corporate environmental performance (CEP) on firm value (FV) and the extent of disclosure of carbon emission by the sampled firms in India, where Corporate Social Responsibility (CSR) practices are mandatory. The analysis is based on secondary data collected from 40 Indian Carbonex-indexed firms from the period 2015–2019. The present study seeks to investigate the extent of disclosure by the firms and how this disclosure impacts the FV. The panel data regression model is employed to examine the impact of CEP on accounting and market-based firm value. This study uses accounting-based measure-ROA and market-based measure-Tobin's Q proxies to measure firm value. CEP is captured by three emission metrics (TCO<sub>2</sub>, EQVE, TENU, and EMC) extracted from the ESG Eikon database. The findings of the study show a positive link between CEP on FV. We also found that the data related to CSR/CEP disclosure of 34, out of 74 non-finance Carbonex companies are either not available or partially available, despite it being mandatory. Further, the study finds that, although the rest of the Carbonex firms are disclosing their environmental policy, some information pertaining to technology and resource efficiency is less disclosed.

**Keywords:** Corporate Environmental Performance, Firm Value, Emission Metrics, Emission Disclosure

**JEL Classification Code:** G32, M14, Q51, Q56

## 1. Introduction

The Intergovernmental Panel on Climate Change (2007) concluded that global warming is triggered by human activity. Against this backdrop, global warming has become a high-priority concern around the world (Saka & Oshika, 2014). Global warming and the rapid change in related environmental issues such as pollution, climate change, water contamination, increased emission of greenhouse gases has come as a clarion call for firms to realign their operational strategies and adopt sustainable business

operations to address these changes. Given the severity and relevance of the subject, many researchers and academicians have worked on finding the linkage between CSR and environmental performance to achieve sustainable business models (Sudha, 2020; Ziegler et al., 2007).

Due to the growing importance of the subject matter, firms are now releasing information concerned with GHG and climate change-related information to maintain legitimacy in both internal management and external stakeholders (Momin et al., 2017). Meeting the corporate environmental performance (CEP), specifically, the emission has significantly impacted the business operation and behavior. Several studies have examined the relationship between carbon emission and firm value. (Matsumura et al., 2014; Habbash, 2017; Lee et al., 2017; Ganda, 2018) examined the firms' disclosure related to climate and also studied the impact of it on firm value. It has been found in studies that there is a significant positive impact of environmental performance on firm value (Purnomo & Widianingsih, 2012; Iwata & Okada, 2011). However, some studies conclude with a negative relationship (Malarvizhi & Matta, 2016; Saka & Oshika, 2014; An et al., 2020). In the backdrop of these varied results, the present study seeks to investigate

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the relationship between CEP and FV. In prior literature the researchers had analyzed the sustainability of the firm; environmental performance of the firm by considering all aspects, but the present study focuses only on firms' carbon performance, where the researcher explored how the carbon emission metrics can impact the firm value and to what extent Indian firms are disclosing their emission-related information.

The study has used the emission-based corporate environmental performance (CEP) metrics, namely, total CO<sub>2</sub> equivalent emissions to revenues USD in millions (TCO<sub>2</sub> EQVE), total energy use to revenues USD in millions (TENUS), emission score (EMSC) as well as the extent of CEP disclosures (policy energy efficiency; renewable energy use; clean technology; resource efficiency objectives) in firms' annual report. A corporate environmental measure enables the firm to adopt strategies to reduce or eliminate the risk arising from climate change and in a way improves on the financial benefit accrued out of this. Further, in this study, the researcher examined the causality relationship between CEP emission metrics on firm value and also analyses the extent of CEP disclosure by the firms concerning environment-based information in their report. Tobin's Q and ROA are used as a proxy to measure firm value. The secondary data is collected from ASSET 4 ESG DataStream database. The study is analytical and descriptive.

The paper is organized into six sections. The first section gives an overview of the subject matter. The second section reviews the prior literature related to the present study and formulates the hypothesis. Section three deals with the methodology carried out in this study, whereas sections four and five describe the models, results, and findings, respectively. Section six concludes the discussion.

## 2. Literature Review

When and how does it pay to be green? It is an interesting question to answer. Habbash (2017) examined the impact of CSR disclosure on firm value and financial performance in Saudi Arabia. Working on 267 annual reports spanning four years 2007–11 and testing the relation between disclosure and its impact on firm value and financial performance with the help of both content and regression analysis, the author found a positive relationship between them. Matsumura et al. (2014) worked on voluntary disclosure of carbon emission and its impact on firm value. Along with it, the expenditure on corporate social responsibility impacts the firm performance as well (Bani-Khaled et al., 2021). Legitimacy theory supports that firms are disclosing their social responsibility information to stakeholders, which make them aware about firms' societal activities or community welfare program (Mahmud, 2019).

The authors used the voluntarily disclosed data under the carbon disclosure project of S&P 500 and found that

the market penalizes the carbon emission, whether the companies disclose the same. Firms that voluntarily disclose the emission are penalized less than the firms that do not. Lewandowski (2017) extended the discussion and, while analyzing the effect of a firm's carbon performance on a firm's financial performance, also tried to find out improvement of carbon performance over time. The results of the study show that carbon emission mitigation is linearly, significantly, and positively related to return on sale (ROS), but negatively related to Tobin. Kengkathran (2018) conducted a literature review study on a specific industry to identify the relationship between environmental, social, and governance (ESG) disclosure and financial performance. The extent of firms' environmental performance has been observed to disclose less by the firms. (Rahman & Masum, 2021) analyzed the extent of CSR disclosure by the Bangladesh firms and found that the firms' CSR are focused on the employee-related and community welfare-related information in their reports and less focused on the energy and customer-based information in the context of the respective country. This shows that their firms are not serious about their environmental performance and this is a major issue that more climate change impacts can be seen on community and environment.

The researcher worked on energy companies in ASEAN and found both positive and negative relationships between ESG disclosure and firm performance. Konar and Cohen (2001) commented on the conflicting association between environment disclosure and financial performances, which are due to subjective environment performance criteria and small sample size. The authors worked on the economic value of S&P 500 firms and demonstrated that bad environment performance is negatively correlated with an intangible asset of the firms. A reduction in toxic chemicals increases the intangible asset value of the firm. The performance of the firm also impacts the reputation of the firm in the market and, to overcome this issue, firms strategically plan their green marketing to maintain increase the brand image (Woo, 2021; Phan et al., 2021).

Since global warming is a very serious issue, the increasing level of greenhouse gases (GHG) has negatively impacted the environment and in turn the community. With regards to it, UN SDGs 13 describes responsible consumption and production. It motivates the firm to be sustainable so that sustainable development goals can be achieved through implementing strategies in business operations. Firms' management should introduce initiatives to reduce or minimize the emission of carbon dioxide in the environment and control using of materials that are harmful to it. In addition to it, they must disclose more and more environmental factors in official reports.

An interesting study was conducted by Hsu and Wang (2013) that examines the relationship between corporate effort to tackle carbon dioxide emissions and firm value.

They studied this relationship with the help of media tone about the firm's efforts to curb the emission. The study resulted in a positive relationship between negative media exposure of firm's response to climate change. Jaggi et al. (2018) found a positive relationship between the carbon discloser and stock price.

In the backdrop of the prior literature reviewed, we seek

- a) To investigate the impact of CEP measures on FV
- b) To analyze the extent of CEP disclosure

Based on literature review above, we propose the following hypotheses:

**H1:** *There is a significant positive impact of emission-based metrics corporate environmental performance (CEP) on firm Tobin's Q.*

**H2:** *There is a significant positive impact of emission-based metrics corporate environmental performance (CEP) on firm ROA.*

### 3. Methodology

#### 3.1. Data

The data about corporate environmental performance and firm value of the BSE Carbonex-listed firm are collected from 2015 to 2019. The non-financial firms are excluded from the study because it has a difference in regulation and nature of industries (Kumar et. al., 2017; Bhatia & Chander, 2014). Secondary data is collected from ASSET 4 ESG DataStream database. EViews11 has been used to run a panel regression model and analyses of statistical tests. After removing financial firms, the final sample of the study is 74 firms but due to the unavailability of data, only 40 firms are selected with 199 firm-year observations.

#### 3.2. Model

In the context of CEP and FV, the study used both accounting and market-based measures of FV. Some studies also employed both while others employed a singular measure of FV. Our study used both measures of FV. This study uses accounting-based measure-ROA and market-based measure-Tobin's Q proxies to measure firm value (FV) (Habbash, 2017; Rahman et al., 2018).

CEP is captured by three emission metrics (TCO<sub>2</sub> EQVE, TONUS, and EMC). These metrics are extracted from the ESG Eikon database; these metrics are mentioned under environmental factors of ESG. CEP disclosure is measured by (policy energy efficiency; renewable energy use; clean technology; resource efficiency objectives) since other data of the remaining 34 firms are not available. The control

variables used in the study are firm size and leverage (Rahman et al. 2018; Ganda, 2018). Subsequently, to test H<sub>1</sub> and H<sub>2</sub>, the following model has been formulated to study the impact of the CEP on FV:

$$CFP_{it}(Q) = \alpha + \beta_1 TCO_2 EQVE + \beta_2 TONUS + \beta_3 EMSC + \beta_4 SIZE + \beta_5 LEV + \varepsilon \quad (1)$$

$$CFP_{it}(ROA) = \alpha + \beta_1 TCO_2 EQVE + \beta_2 TONUS + \beta_3 EMSC + \beta_4 SIZE + \beta_5 LEV + \varepsilon \quad (2)$$

Where,

Corporate financial performance (CFP), total CO<sub>2</sub> equivalent emissions to revenues USD in millions (TCO<sub>2</sub> EQVE), total energy use to revenues USD in millions (TONUS), emission score (EMSC), Tobin's Q (Q), return on assets (ROA), i & t (individuals and time), and error ( $\varepsilon$ ).

#### 3.3. Measurement of Variables

##### Dependent variables

- (1) Tobin's Q: Q is measured as the market capitalization of the firm divided by the replacement cost of the asset.

$$\text{Tobin's Q} = \frac{\text{Market Enterprise Value of Firm}}{\text{The total Asset value of Firm}}$$

- (2) Return on assets: ROA is the measure of profitability ratio. It is measured by the net income of the firm divided by the firms' total assets.

$$ROA = \frac{\text{Net Income}}{\text{Total Assets}}$$

##### Explanatory variables

- (1) Total CO<sub>2</sub> equivalent emissions to revenues USD in millions (TCO<sub>2</sub> EQVE): It is one of the factors of the ESG variable of Thomson's Reuters Eikon data stream. This variable is mentioned under the environmental measures of ESG. A carbon dioxide (CO<sub>2</sub>) and CO<sub>2</sub> equivalent emission in tons per million in U.S. dollars.
- (2) Total energy use to revenues USD in millions (TONUS): It is one of the factors of the ESG variable of Thomson's Reuters Eikon data stream. This variable is mentioned under the environmental measures of ESG. The total carbon dioxide (CO<sub>2</sub>) and CO<sub>2</sub> equivalents emission in tons in revenues is equal to one million U.S. dollars.

- (3) Emission score (EMSC): It is one of the factors of the ESG variable of Thomson's Reuters Ekion data stream. This variable is mentioned under the environmental measures of ESG. The total energy consumption by firms' operations is measured into revenue that is equal to one million U.S. dollars.
- (4) Policy energy efficiency (Policy\_EE): Firms are publishing policy that is related to energy efficiency. Policy on energy efficiency contributes to less growth of CO<sub>2</sub> emission. Under ESG this variable is mentioned under the environment dimensions that provide the data on whether companies disclose it or not through 0 and 1 (absence and presence).
- (5) Renewable energy use (RENEW): To be sustainable and to protect the community from hazardous pollution or smoke. To reduce the impact of it firms' are utilizing more and more renewable energy. Lesser energy bills are one of the most effective manners that green energy will save businesses money. Solar panels, wind turbines, and other sources of renewable energy may be installed on business properties and used to fuel operations.
- (6) Clean technology (Clean\_Tech): Any process, product, or service that reduces negative environmental impacts through substantial energy efficiency changes, sustainable resource usage, or environmental conservation activities is referred to as clean technology or cleantech. Recycling, renewable energy, information technology, and green transportation all come under the category of clean technology.
- (7) Resource efficiency objectives (ReOb): A Resource efficiency objective provides information on whether the firms' have some targets to achieve energy efficiency level in business operation and its comparison with the last years. Initiatives are undertaken by the firm to enhance energy efficiency.
- (8) Firm size: Measured by taking a log of total assets.
- (9) Leverage: Measured by dividing firms' liability by equity.

### 3.4. Estimation Method

- (a) *The method used to test the impact of CEP on FV*  
The study attempts to empirically examine the association between CEP and FV. To test this relation, panel regression (Pool OLS regression model) is run to determine statistically significant evidence among measures of CEP-emission metrics and FV. Table 1 explains the key variables considered in the present study and their definition of it.
- (b) *The extent of firms' CEP disclosure*  
For assessing the extent of firms' CEP disclosure the researcher has considered four variables of

environmental disclosure from the Ekion DataStream, which is related to emission only. The study aims to analyze to what extent firms' are disclosing their emission metrics other than mandated activities (Table 2). Like publishing environmental policy is mandatory for Indian firms, but disclosing of emissions is voluntary. Therefore, the binary coding is done on the presence and absence of disclosure over the year (2015–2019).

## 4. Results and Discussion

### 4.1. CEP Impacts FV

Table 3 shows the descriptive results of dependent and independent variables. The average of ROA is 10.53%; Tobin's Q is 2.85. Tables 4 and 5 reports the panel OLS regression result of variables with sampled firms from 2015–2019 of Equations 1 and 2, respectively, with Tobin's Q and ROA as dependent variables.

Equation 1 estimates the impact of CEP on FV by considering Tobin's Q as a dependent variable.  $R^2$  shows that 20.9 percent variation independent variables are explained

**Table 1:** Key Variables and Their Definition

Key Variables	Description
TCO <sub>2</sub> EQVE	Total CO <sub>2</sub> Equivalent Emissions to Revenues USD in millions
TENUS	Total Energy Use To Revenues USD in millions
EMSC	Emission score: The emission category score measures a company's commitment and effectiveness towards reducing environmental emission in the production and operational processes
Q	Tobin's Q
ROA	Return on assets
SIZE	Firm size
LEV	Leverage

**Table 2:** Disclosure and Definitions

Disclosures	Description
Policy_EE	Policy Energy Efficiency
RENEW	Renewable energy use
Clean_Tech	Clean Technology
ReOb	Resource Efficiency Objectives

**Table 3:** Descriptive Analysis

Variables	N	Observations	Mean	Std.	Maximum	Minimum
TCO <sub>2</sub> EQVE	40	199	1862.85	3783.86	20908.88	7.73
TENUS	40	199	7833.06	13796.49	59509.89	19.81
EMSC	40	199	69.56	23.25	99.33	2.29
ROA	40	199	10.53	10.96	73.79	-9.51
Q	40	199	2.85	2.72	10.81	0.14

**Table 4:** Impact of CEP on Tobin's Q

Variables	Coefficient	Std. Error	t-statistic	Prob.
C	2.59	0.24	10.78	0.00
LOG(TENUS)	0.07	0.03	2.43	0.014
LOG(TCO <sub>2</sub> EQVE)	-0.25	0.02	-8.80	0.00
LOG(EMSC)	-0.30	0.05	-5.42	0.00
R-squared	0.209			
Adjusted R-square	0.206			

Regression (equation 1).

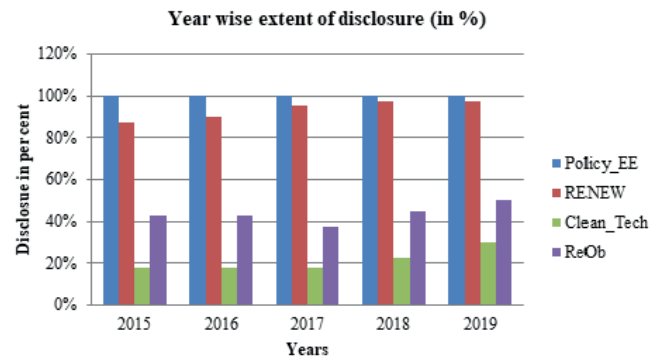
**Table 5:** Impact of CEP on ROA

Variables	Coefficient	Std. Error	t-statistic	Prob.
C	19.01	3.034	6.26	0.00
LOG(TENUS)	-1.67	0.35	-4.68	0.00
LOG(TCO <sub>2</sub> EQVE)	0.20	0.382	0.52	0.59
LOG(EMSC)	-0.25	0.69	-0.37	0.71
R-squared	0.095			
Adjusted R-square	0.091			

Regression (equation 2).

by independent variables. From the above result the sig. value of all dependent variables is less than 0.05 so, it can be concluded that independent variables have significant impacts on the dependent variable.

Equation 2 estimates the impact of CEP on FV by considering ROA as the dependent variable. R<sup>2</sup> shows that 9.5 percent variation independent variables are explained by independent variables. Sig. value  $p \leq 0.05$  presents a significant relationship; the  $p$ -value of TENUS is less than  $p \leq 0.05$  that is 0.00, which interprets that TENUS



**Figure 1:** The Extent of CEP Disclosure from 2015–2019 in Percentages

significantly impacts the ROA of the firm. Whereas, the other two variable's  $p$ -value is greater than 0.05, which interprets the TCO<sub>2</sub>EQVE and EMSC are not significantly impacted the firm value (ROA) of the firm. Therefore, the study concludes that the CEP positively impacts the firm performance, which is supported by the prior works of literature also (Ifada et al., 2021)

#### 4.2. The Extent of CEP Disclosure

Broadstock et al. (2018) analyzed the disclosure of greenhouse gases and their impact on business performance and founds that there is a positive relationship between firms' GHG emission on business performance. In line with this, the second objective of the study aims to analyze the extent of CEP disclosure by firms over the year that is from 2015–2019. To analyze this study considered four emission-based CEP measures to observe the extent of disclosing.

Figure 1 shows the extent of year-wise disclosure in percentage. In 2000, India's primary energy demand was around 450 million tons of oil equivalent (toe), but by 2012, it had risen to around 770 million tons. In 2030, this is projected to grow from about 1250 million tons (according to the International Energy Agency) to 1500 million tons (according to the Integrated Energy Policy Report).

The policy on energy efficiency (Policy\_EE) and the usage of renewable energies (RENEW) are published by the entire firm as it is mandated for the firm, but other measures are voluntary action. The disclosure of the utilized clean technology (Clean\_Tech) and resource efficiency objectives (ReOb) are less disclosed by the firm. Under ReOb the firms are required to publish their energy efficiency in their business operations and compare it with the previous years.

## 5. Conclusion

Legitimacy theory posits that the firm should be sustainable, and it makes the firms responsible to address societal issues for their interest (Ganda, 2018; Momin et al., 2017). The result of the study support that firms' environmental performance does impact the FV (Kumar & Firoz, 2018). The study examines the impact of CEP measures on firm value, concerning both accounting and market-based indicators, ROA and Tobin's Q, respectively. Evidence from the resulting exhibit that the TCO<sub>2</sub> EQVE, TONUS, and EMSC have a positive impact on Tobin's Q, but only TONUS positively impacts the ROA of the firm, and the rest of the variables have a negative impact. This shows that the environmental performance of the firm increases the firm value positively to some extent and the firm must be engaged in reducing carbon emissions by implementing advanced techniques. On the other hand, the extent of CEP disclosure implies that the extent of environmentally-related variables is less disclosed by the firm.

The findings also suggest some recommendations to policy-makers or government. The Ministry of Power's "Perform, Achieve, and Trade" scheme aims to provide "additional revenues" to firms that achieve energy savings by allowing them to receive and trade "Energy Savings Certificates" (Sudha, 2020). These rewards must be initiated to praise and incentivize the firm's activities related to climate change. Emphasis on "reducing carbon dioxide or GHG emissions" is a highly prioritized issue in business operation as SDGs 13 targets the firm to combat climate change and its impact. Thus, the findings support the policy-makers initiatives aimed at achieving environmental performance efficiency and encourage businesses to implement them, ensuring a win-win situation that benefits both the environment and financial performance.

The study also has some limitations, due to the availability of the data on other environmental metrics. Further, the study can be extended by employing both financial and non-financial firms with longitudinal analysis on ten years of data. There can be an extension of variables also by adding the firms' industry nature (sensitive and non-sensitive firms) that too can provide the rigorous result on causality relationship between environmental performance and financial performance.

## References

- An, H. T., Kim, J. Y., Kwak, J., & Su, B. K. (2020). The Correlation between Climate Change and Corporate Performance. *Journal of Scientific & Industrial Research*, 79, 38–43.
- Bani-Khaled, S., El-Dalabeeh, A., Al-Olimat, N., & Al Shbail, M. (2021). Relationship Between Corporate Social Responsibility Expenditures and Performance in Jordanian Commercial Banks. *Journal of Asian Finance, Economics and Business*, 8(3), 539–549. <https://doi.org/10.13106/jafeb.2021.vol8.no3.0539>
- Bhatia, A., & Chander, S. (2014). Corporate social responsibility disclosure by SENSEX companies in India. *Management and Labour Studies*, 39(1), 1–17.
- Broadstock, D. C., Collins, A., Hunt, L. C., & Vergos, K. (2018). Voluntary disclosure, greenhouse gas emissions and business performance: Assessing the first decade of reporting. *The British Accounting Review*, 50(1), 48–59.
- Doda, B., Gennaioli, C., Gouldson, A., Grover, D., & Sullivan, R. (2016). Are corporate carbon management practices reducing corporate carbon emissions? *Corporate Social Responsibility and Environmental Management*, 23(5), 257–270.
- Ganda, F. (2018). The influence of carbon emissions disclosure on company financial value in an emerging economy. *Environment, Development and Sustainability*, 20(4), 1723–1738.
- Habbash, M. S. (2017). Corporate Social Responsibility Disclosure, Financial Performance and Firm Value: The Case of Saudi Arabia. *Arab Journal of Administrative Sciences*, 24(1).
- Hsu, A. W. H., & Wang, T. (2013). Does the market value corporate response to climate change? *Omega*, 41(2), 195–206.
- Ifada, L. M., Indriastuti, M., Ibrani, E. Y., & Setiawanta, Y. (2021). Environmental Performance and Environmental Disclosure: The Role of Financial Performance. *Journal of Asian Finance, Economics and Business*, 8(4), 349–362. <https://doi.org/10.13106/jafeb.2021.vol8.no4.0349>
- Iwata, H., & Okada, K. (2011). How does environmental performance affect financial performance? Evidence from Japanese manufacturing firms. *Ecological Economics*, 70(9), 1691–1700.
- 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.
- Kengkathran, S. (2018). A literature review on the impact of environmental, social, and governance (ESG) disclosure on the financial performance of energy companies in ASEAN. *Global Business and Management Research*, 10(3), 1071.
- Konar, S., & Cohen, M. A. (2001). Does the market value environmental performance? *Review of Economics and Statistics*, 83(2), 281–289.
- Kumar, P., & Firoz, M. (2018). Impact of climate change disclosure on financial performance: an analysis of Indian firms. *Journal of Environmental Accounting and Management*, 6(3), 185–197.

- Kumar, P., Kumar, N., Gupta, S. K., & Sharma, R. K. (2017). Impact of Corporate Governance and Financial Parameters on Profitability of the BSE 100 Companies. *IUP Journal of Corporate Governance*, 16(1).
- Lamboglia, R., Paolone, F., & Mancini, D. (2019). Determinants of the implementation of environmental risk indicators: Empirical evidence from the Italian manufacturing context. *Corporate Social Responsibility and Environmental Management*, 26(2), 307–316.
- Lee, S. Y., Park, Y. S., & Klassen, R. D. (2015). Market responses to firms' voluntary climate change information disclosure and carbon communication. *Corporate Social Responsibility and Environmental Management*, 22(1), 1–12.
- Lewandowski, S. (2017). Corporate carbon and financial performance: The role of emission reductions. *Business Strategy and the Environment*, 26(8), 1196–1211.
- Mahmud, M. T. (2019). Legitimacy Theory and its Relationship to CSR Disclosures: A Literature Review. *Journal of Economic Research*, 163, 1–16.
- Malarvizhi, P., & Matta, R. (2016). Link between Corporate Environmental Disclosure and Firm Performance—Perception or Reality? *The British Accounting Review*, 36(1), 107–117.
- Matsumura, E. M., Prakash, R., & Vera-Munoz, S. C. (2014). Firm-value effects of carbon emissions and carbon disclosures. *The accounting review*, 89(2), 695–724.
- Momin, M. A., Northcott, D., & Hossain, M. (2017). Greenhouse gas disclosures by Chinese power companies: trends, content and strategies. *Journal of Accounting & Organizational Change*, 13(3), 331–358.
- Phan, C. X., Le, L. V., Duong, D., & Phan, T. C. (2021). The Impact of Corporate Social Responsibility on Brand Image: A Case Study in Vietnam. *Journal of Asian Finance, Economics and Business*, 8(4), 423–431. <https://doi.org/10.13106/jafeb.2021.vol8.no4.0423>
- Purnomo, P. K., & Widianingsih, L. P. (2012). The influence of environmental performance on financial performance with corporate social responsibility (CSR) disclosure as a moderating variable: evidence from listed companies in Indonesia. *Review of Integrative Business and Economics Research*, 1(1), 57.
- Rahman, M. M., & Masum, M. H. (2021). Extent of Corporate Social Responsibility Disclosure: Evidence from Bangladesh. *Journal of Asian Finance, Economics and Business*, 8(4), 563–570. <https://doi.org/10.13106/jafeb.2021.vol8.no4.0563>
- Rahman, N. R. A., Rasid, S. Z. A., & Basiruddin, R. (2018). Signaling Firm Performance through Voluntary Carbon Reporting: Testing a Moderating Role of Corporate Governance. *Global Business & Management Research*, 10(3).
- Saka, C., & Oshika, T. (2014). Disclosure effects, carbon emissions and corporate value. *Sustainability Accounting, Management and Policy Journal*, 5(1), 22–45.
- Şamiloğlu, F., Öztıp, A. O., & Kahraman, Y. E. (2017). The determinants of firm financial performance: Evidence from Istanbul Stock Exchange (BIST). *IOSR Journal of Economics and Finance (IOSR-JEF)*, 8(6–1), 62–67.
- Sudha, S. (2020). Corporate environmental performance–financial performance relationship in India using eco-efficiency metrics. *Management of Environmental Quality: An International Journal*, 31(6), 1497–1514.
- Tang, S., & Demeritt, D. (2018). Climate change and mandatory carbon reporting: Impacts on business process and performance. *Business Strategy and the Environment*, 27(4), 437–455.
- Tsou, Y. H., Huang, Y. F., Liu, S. C., & Do, M. H. (2021). The Effects of Total Quality Management and Corporate Social Responsibility on Firm Performance: A Future Research Agenda. *Journal of Asian Finance, Economics and Business*, 8(4), 277–287. <https://doi.org/10.13106/jafeb.2021.vol8.no4.0277>