

Carbon Emission Disclosure in Indonesian Consumer Goods Manufacturing Companies During Covid-19 Pandemic

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ABSTRACT

Disclosing carbon emission in the annual reports will assist the stakeholders to assess the company's role in reducing the greenhouses gases and assist the investors to decide their investments. Therefore, the objective of this research is to test the effect of environmental performance, international certification, board independence, and board female on carbon emission disclosure during Covid-19. The population used in this research is all consumer goods manufacturing companies listed in Indonesia Stock Exchange period 2020-2021. Purposive sampling is used in this research with some criteria made. The analysis method is multiple linear regression with SPSS 22 as a tool. The results of this research prove that environmental performance and board independence have significant positive effects on carbon emission disclosure whereas international certification and board female do not have any significant effects on carbon emission disclosure. These findings are expected to provide solutions for companies to increase carbon emission disclosure, as well as suggested for companies to increase the role of the female board to oversee the company activities so that carbon emission disclosure becomes more effective and widespread.

Keywords: Carbon Emission Disclosure, Environmental Performance, International Certification, Board Independence, Board Female.

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INTRODUCTION

Indonesia is a wealthy country in natural resources (Sihombing & Banke, 2023). There are various kinds of natural wealth that can be found in Indonesia, such as products from forestry, mining, animal production, and so on. Natural wealth is used to meet the

needs of people's lives. However, Indonesia is included as a country that has environmental problems. Those problems become more complex and various, such as deforestation, environmental pollution, excessive exploitation of mineral goods, and so on (Laily & Najicha, 2022). This problem triggers global warming.

Global warming is a natural phenomenon with conditions of increasing temperatures that are getting hotter due to human activities. This natural phenomenon could also arise due to increased greenhouse gas emissions from industry (Nurlis, 2019). The impact of global warming could certainly damage people's lives and result in natural disasters which have increased from 2010 to 2020 based on data from BNPB (Detikinet, 2022). The greenhouse gas inventory report concluded that the total carbon produced by Indonesia until 2019 is 1,866,552 CO₂e, which was dominated by the energy sector (Badan Pusat Statistik, 2019).

In addition, the latest phenomenon that has just occurred was in 2022 where it was the highest on record in producing carbon dioxide. The International Energy Agency said that the increase in energy production would reach 36.8 gigatonnes in 2022. This increase in carbon dioxide emissions resulted from the release of fossil fuels, resulting in climate warming (VOA Indonesia, 2023).

As a result of this increase in temperature, finally, a meeting between countries was held to discuss a global warming agreement where this agreement was made in the form of the 1997 Kyoto protocol, which finally many countries ratified the protocol in law (Pramuditya & Budiasih, 2020).

In addition, the secretary general of the national energy council, Djoko Siswanto, revealed that there was a reduction in carbon emissions of 579 tons in 2020. This was due to the conditions of the Covid-19 pandemic where company, industrial and community activity decreased (Ekonomi, 2021). During the Covid-19 pandemic, the government made every effort to restore the country's economy. The recovery of the country's economy led to a spike in higher carbon emissions. Because of that, this can be a challenge for the world to create the green economy (Kompas, 2022).

Carbon emission disclosure in Indonesia is still voluntary, so not all companies disclose information about disclosing carbon emissions (Nurlis, 2019). Nevertheless, carbon emission disclosure is a matter that develops in various parts of the world, including Indonesia. In PSAK 1 revision 2018 paragraph 14 it is disclosed that companies can also present additional reports containing reports about environment, especially for companies that have an important role in the environment (Astuti & Setiany, 2021). The purpose of disclosing carbon emissions is as material for decision making by internal and external parties of the company.

Furthermore, Sekarini & Setiadi (2021) explained in their research that carbon emission disclosure can be used as a form of corporate's role in tackling, mitigating, and reducing the greenhouse gases and as a form of the company's concern for the environment. This has been regulated in Indonesian Law No. 4/1982 where a business entity needs to maintain the harmonious and balanced environmental sustainability to support the sustainable development. Furthermore, an accounting treatment for global warming issues can be developed through carbon emission disclosure. The company

addresses the issues of global warming by outlining the company's approach to the carbon generated by its operations in the annual or sustainability reports. This disclosure allows the companies to take precautions and reduce their carbon emissions (Setiany et al., 2022).

Based on the phenomenon and the importance of disclosing carbon emissions in a company's annual report, there are several factors that can influence the carbon emission disclosure. These factors will be analyzed in this research, such as environmental performance, international certification, and the characteristics of a board consisting of independent commissioners, board diversity, and board size.

Several researches about carbon emission disclosure have been analyzed and discussed by prior researchers. However, the results from the previous researches showed the inconsistent and different results from each researcher. Therefore, the objective of this research is to analyze and test the effect of environmental performance, international certification, board independence, and board female on carbon emission disclosure. The findings of this research can be used as a contribution form of scientific and theoretical development, fill up the research gap, and increase the awareness from companies to disclose highly and widely the information of carbon emission in their annual or sustainability reports. Moreover, the novelty of this research is the usage of the updated samples from consumer goods manufacturing companies listed in Indonesia Stock Exchange, period 2020-2021, which were the period during the Covid-19 pandemic.

LITERATURE REVIEW

Legitimacy Theory

Legitimacy theory is a theory that focuses on the interaction between companies and the public, so that companies will do their best to gain legitimacy from the public or investors. This theory also explains how companies are expected to react and pay attention to social and environmental issues based on company operations and activities (Ghozali, 2020). The relevance of the theory of legitimacy and carbon emission disclosure is that companies that are part of the public must comply with the norms that apply in society, one of them is carbon emission disclosure. This will make the company gain legitimacy from the public who state that the company carries out activities in accordance with applicable regulations or laws (Simamora et al., 2022). Companies that disclose carbon emission disclosure in the annual reports are viewed as a company that has a good reputation. This good reputation can be achieved through the economic, social, transparency, and environmental performance (Riantono & Sunarto, 2022). The better reputation, the better corporate sustainability.

The Effect of Environmental Performance on Carbon Emission Disclosure

In order to preserve the environment, the Ministry of Environment gives awards to companies that have environmental performance. The environmental performance award is in the form of a PROPER rating. If the PROPER rating obtained by the company is high, then the disclosure made by the company regarding the environment will be wider so that the company continues to gain legitimacy and a positive response from the public (Sekarini & Setiadi, 2021). Carbon emission which is disclosed by the company

voluntarily is done to prevent the spread of negative information from the public. Therefore, when the company's environmental performance is high, the company's image will be higher because this indicates that the company cares about the environment in which the company operates. The results of previous studies conducted by Maulidiavitasari & Yanthi (2021), Nurlis (2019), and Saptiwi (2019) concluded that environmental performance proxied by PROPER had a positive effect on carbon emission disclosure. The positive relationship between environmental performance and carbon emission disclosure is because the high PROPER rating indicates that companies have been able to overcome the environmental matters so that the trust from external parties can be preserved (Nurlis, 2019). Therefore, the first hypothesis proposed in this research is stated as:

H₁ = Environmental performance has a positive effect on carbon emission disclosure.

The Effect of International Certification on Carbon Emission Disclosure

The international certification that evaluates environmental management is ISO 14001. Companies with ISO 14001 certification will get a benefit in terms of reducing the impact on the environment and increasing environmental performance. The company's image and the company's level of concern for protecting and improving the environment will be increasingly boosted when the company has ISO 14001 certification. Previous research conducted by Rahmawati & Budiwati (2018) and Suhardjanto et al. (2018) concluded that there was a positive effect between ISO 14001 on carbon emission disclosure. Companies that own ISO 14401 means that they have a commitment to always make continuous improvements so that the products produced by the company are expected to have high excellence and be accepted by stakeholders interests (Rahmawati & Budiwati, 2018). Moreover, ISO 14001 can be used as a strategy to obtain a legitimation from the public (Suhardjanto et al., 2018). Therefore, the second hypothesis proposed in this research is stated as:

H₂ = International certification has a positive effect on carbon emission disclosure.

The Effect of Board Independence on Carbon Emission Disclosure

It is important for the management to have a good corporate governance so that the role of the board of commissioners and directors is able to improve the quality and value of the company (Setiawan et al., 2019). Board independence is a party who has a neutral role towards the other boards of commissioners and directors. In their duties, they have an obligation to formulate policies to be able to create positive company performance, including one of the policies related to the carbon emission disclosure as a form of transparent information within the company (Ummah & Setiawan, 2021). Previous research conducted by Saraswati et al. (2021), Trufvisa & Ardiyanto (2019), and Yunus et al. (2016) stated that board independence had a positive effect on carbon emission disclosure. This means that the high composition of board independence can maintain the transparency and expand the company's sensitivity of the social demand (Trufvisa & Ardiyanto, 2019). Therefore, the third hypothesis proposed in this research is stated as:

H₃ = Board independence has a positive effect on carbon emission disclosure.

The Effect of Board Female on Carbon Emission Disclosure

Board female is one of the examples of the diversity of the board of commissioners which can be found in a company. The role of female commissioners in a company is very important, especially related to the carbon emission disclosure because the higher number of female commissioners, the wider the carbon emission disclosure. This is because female commissioners have a high orientation related to environmental issues, are considered more ethical, avoid risks, and care for the public interest. Research by Hariswan et al. (2022), Saraswati et al. (2021), and Ummah & Setiawan (2021) stated that female commissioners had a positive effect on carbon emission disclosure. With this diversity, the considerations related to the decision-making process will be higher because there are various concepts of thoughts, ideas, and knowledge (Trufvisa & Ardiyanto, 2019). Therefore, the fourth hypothesis proposed in this research is stated as: **H₄** = Board female has a positive effect on carbon emission disclosure.

METHODS

This research is categorized as causal research with a quantitative approach, namely testing variables and hypotheses with statistical procedures. The population used in this research are all manufacturing companies in the consumer goods sector that are listed on the Indonesia Stock Exchange for the 2020-2021 period. The sampling technique used was purposive sampling, which means that samples were taken with several criteria, such as consumer goods manufacturing companies listed on the Indonesia Stock Exchange, making profits, having PROPER ratings, and publishing annual reports and financial reports consistently from 2020-2021. The fixed total samples used in this research is 40 observations. Data collection for this research is done by literature reviews and documentation study, meaning that researcher downloaded the annual reports from the Indonesia Stock Exchange or from the company's official websites to collect all the information related to each variable used in this research. Multiple linear regression is used to analyze the data with the help of the SPSS version 22.

This research employs an index of carbon emission disclosure according to Choi et al (2013). There are eighteen details of carbon emission disclosure with five categories; climate change, greenhouse gas, energy consumption, reduction and cost, and accountability of emission carbon. The following procedures regarding to the carbon emission disclosure are assigning 1 if the company discloses the items of the index carbon emission disclosure and assigning 0 if the company does not disclose. Then, sum the scores and the overall scores are divided by 18 as a maximum number of the items.

Environmental performance is the first independent variable which is proxied by the PROPER ratings issued by Ministry of Environment. This variable is measured at ordinal scale. The aim of the PROPER ratings is to encourage the companies to improve the environmental management, so that it is not polluted or damaged due to the company's activities.

International certification is measured by a dummy variable that assigning 1 if the company has ISO 14001 and assigning 0 if the company does not have ISO 14001 or others. ISO 14001 is a standard related to environmental management in order to help the companies minimizing the negative impacts of their activities on the environment.

Board independence is measured by the ratio of independent commissioners in the company. Board independence is viewed as a party who does not have any relationship with the members of board of directors and commissioners, as well as with the controlling shareholders. The presence of the board independence in the company will supervise the activities and push the company to disclose the carbon emission in order to fulfill the expectations and demands from the stakeholders.

Board female is measured by the ratio of female commissioners in the company. Female commissioners have a good orientation related to environmental issues and perceived as more ethical.

Table 1. Variable Measurement

Variable Names	Indicators	Scale
Carbon Emission Disclosure	It is measured by dividing the total disclosure which are disclosed by the company to the total maximum of the disclosure according to Choi et al (2013).	Ratio
Environmental Performance	It is measured by PROPER rating: 1 = very bad (black) 2 = bad (red) 3 = good (blue) 4 = very good (green) 5 = excellent (gold)	Ordinal
International Certification	Assigning 1 if the company disclosed ISO 14001 while 0 if the company did not disclose ISO 14001 or others.	Nominal
Board Independence	It is measured by dividing the total independent commissioners to the grand total commissioners in the company.	Ratio
Board Female	It is measured by dividing the total female commissioners to the grand total commissioners in the company.	Ratio

Source: Prior Research, 2022

RESULTS

Table 2. Descriptive Statistics

Variable	Obs.	Minimum	Maximum	Mean	Std. Dev
Carbon Emission Disclosure	40	0.000	0.722	0.329	0.191
Environmental Performance	40	2.000	5.000	3.200	0.564
International Certification	40	0.000	1.000	0.600	0.496
Board Independence	40	0.333	0.833	0.469	0.129
Board Female	40	0.000	0.500	0.148	0.167

Source: SPSS, 2022

Based on the results of the descriptive statistical test in table 2, the carbon emission disclosure by manufacturing companies in the consumer goods sector shows that an average of 33 percent discloses carbon emissions in the annual report during the research period, with a maximum value of 0.722 from PT Industri Jamu and Pharmacy Sido Muncul Tbk. The environmental performance shows an average value of 3.2, meaning that the majority of the samples used in this research have good (blue) PROPER ratings. The minimum environmental performance value of 2 means that the PROPER obtained by the company is red (very bad) and the maximum value of 5 means that the

company gets gold PROPER (excellent). International certification shows that there were 24 companies that had ISO 14001. Board independence shows that the average of 46.9 percent of the samples has already followed the minimum amount of independent commissioners in a company according to the regulation of OJK No.57/POJK.04/2017, with the maximum value is 0.833 and minimum value is 0.333. Board female shows an average of 14.8 percent with the maximum value of 0.5 belonging to PT Merck Indonesia.

Table 3. Regression Results

Model	Unstandardized Coefficients		t-Statistics	Sig.
	β	Std. Error		
Constant	-0.305	0.162	-1.878	0.069
Environmental Performance	0.108	0.046	2.322	0.026
International Certification	0.064	0.053	1.216	0.232
Board Independence	0.447	0.207	2.164	0.037
Board Female	0.277	0.160	1.735	0.091
R Square			0.379	
Adjusted R Square			0.308	
F test			5.344	0.002
Obs.			40	

Source: SPSS, 2022

Based on the regression results in table 3, it can be seen that the value of adjusted R square is 0.308 meaning that the component of independent variable to explain the carbon emission disclosure is 30.8 percent whereas the remaining 69.2 percent is explained by other components or factors which are not included in this research. The F test show that the significant value is 0.002 meaning that the research model is feasible and able to predict the carbon emission disclosure. From the multiple regression results presented in table 3, it can be summed up that the first hypothesis in this research is received, stating that environmental performance has a positive effect on carbon emission disclosure. This can be seen from the significant value 0.026 lower than 0.05 with a positive coefficient direction of 0.108. The second hypothesis in this research is rejected, stating that international certification does not have a positive effect on carbon emission disclosure. This can be seen from the significant value of 0.232 greater than 0.05 with a positive coefficient direction of 0.064. The third hypothesis in this research is received, stating that board independence has a positive effect on carbon emission disclosure. This can be seen from the significant value 0.037 lower than 0.05 with a positive coefficient direction of 0.447. The fourth hypothesis in this research is rejected, stating that board female does not have a positive effect on carbon emission disclosure. This can be seen from the significant value 0.091 greater than 0.05 with a positive coefficient direction of 0.277.

DISCUSSION

The Effect of Environmental Performance on Carbon Emission Disclosure

The hypothesis testing shows that there is a positive effect of environmental performance measured by PROPER rank on carbon emission disclosure, meaning that the higher value of environmental performance, the higher carbon emission disclosure because the companies who have good environment have overcome the environmental

problems actively and cared to the environment so that they will disclose their environmental information like carbon emission disclosure in their annual reports. The legitimacy theory supports the result in this research that the companies are increasingly disclosing the carbon emission disclosure as a form of corporate responsibility to the public in order to obtain the legitimacy or confession from them, as well as to enhance the company's image. By disclosing the carbon emission disclosure, this indicates that they play an active role in reducing the greenhouse gas effect, tackling climate change, and creating a green economy. The result of this research is in line with the previous research conducted by Maulidiavitasari & Yanthi (2021), Nurlis (2019), and Saptiwi (2019) stated that environmental performance positively affects carbon emission disclosure.

The Effect of International Certification on Carbon Emission Disclosure

The hypothesis testing shows that international certification does not have an effect on carbon emission disclosure. This result means that the higher the value of international certification does not affect the companies to disclose their information related to carbon emission in their annual report. Furthermore, the ownership of ISO 14001 cannot give a guarantee that the companies have made efforts to reduce the risks from climate change (Maqfirah & Fahrianta, 2022). Carbon emission disclosure does not increase because of the ownership of ISO 14001. The company that owns ISO 14001 is not the main factor of the stakeholder's decision (Ummah & Setiawan, 2021). Previous research conducted by Anggraini & Handayani (2021) Maqfirah & Fahrianta, (2022) and Ummah & Setiawan (2021) also prove and support the result in this research which states that international certification proxied by ISO 14001 does not affect carbon emission disclosure. The result of this research also does not support the legitimacy theory that the ownership of ISO 14001 is a way obtain the legitimacy from the public.

The Effect of Board Independence on Carbon Emission Disclosure

The hypothesis testing shows that board independence has a positive effect on carbon emission disclosure. This means that the higher board independence in a company, the higher carbon emission is disclosed in the annual report. Transparency and information disclosure can be maintained by the board independence, so as to information the asymmetry information. Moreover, the board independence in the company has a tendency to present a broader accountability and has the ability to take an objective decision that is in line with the social values (Trufvisa & Ardiyanto, 2019). The result of this research is in line with Saraswati et al. (2021), Trufvisa & Ardiyanto (2019) and Yunus et al. (2016) which state that board independence positively affects carbon emission disclosure.

The Effect of Board Female on Carbon Emission Disclosure

The hypothesis testing shows that board female does not have an effect on carbon emission disclosure. This means that how many female commissioners in the company will not affect the company disclose the carbon emission disclosure widely in the annual report. This trigger is thought to be due to the weakness of female commissioner's ability to monitor the company activities to achieve positive goals in the future and the inefficiency of their role in making decisions. The research conducted by (Wirawan & Setijaningsih, 2022) stated that there is no an effect between board female and carbon

emission disclosure is because board female is not more competent than board male. Previous research by Astuti & Setiany (2021), Pratama (2021), and Wirawan & Setijaningsih (2022) supported the result in this research which states that board female does not affect carbon emission disclosure.

CONCLUSION

By testing the 40 units of samples, it can be concluded that only environmental performance and board independence that affect positively and significantly carbon emission disclosure. This indicates that the higher environmental performance and board independence in a company will push or increase the carbon emission disclosure. This disclosure will create a corporate sustainability and show the stakeholders and other external parties that the company is very responsible to the society in accordance with the legitimacy theory. Nevertheless, board female and international certification are proven to not affect the carbon emission disclosure. This means that their presence has not yet been effective in order to supervise the company's activities related to carbon emission disclosure.

This research has a number of limitations which can be used for improvements in the next research with the same topic. This research only focused on the good consumers manufacturing companies listed in Indonesia Stock Exchange period 2020-2021 which mainly the period of Covid-19 pandemic. The sampling technique used in this research was purposive sampling. This technique was only limited on the samples that were fit to the criteria made by the researcher. Moreover, it could be seen that the carbon emission disclosure by the companies in annual or sustainability reports was only 32.9% or around 12 or 13 companies from 40 samples used. This indicates that the carbon emission disclosure has not yet been effectively disclosed by the consumer goods manufacturing companies in 2020-2021. Furthermore, the ability of the independent variables used in this research to influence carbon emission disclosure, such as environmental performance, international certification, board independence, and board female was 30.8%. This gave a review that there are still many factors outside of this research that might affect the carbon emission disclosure. From those limitations, future researchers are recommended to use different research sample, extend the period's research, and use other independent variables that might affect carbon emission disclosure.

Furthermore, the findings of this research are expected to update the previous studies and evolve the theoretical knowledge. Government can also take this finding as a consideration in increasing the effectiveness of carbon emission disclosure regulation so that companies can decrease the negative impacts of carbon emission and create the green economy and healthy atmosphere.

REFERENCES

- Anggraini, S. P., & Handayani, S. (2021). Pengaruh Tekanan Stakeholders, Sertifikasi ISO 14001, Profitabilitas dan Leverage terhadap Pengungkapan Emisi Karbon. *Jurnal Ilmu Komputer, Ekonomi Dan Manajemen (JIKEM)*, 1(1), 153–168.

- Astuti, T. W., & Setiany, E. (2021). The Effect of Board Characteristics on Carbon Emission Disclosure. *International Journal of Management Studies and Social Science Research*, 3(5), 207–216.
- Badan Pusat Statistik. (2019). Emisi Gas Rumah Kaca Menurut Jenis Sektor Ribuan Ton CO₂e, 2000-2019. Retrieved November 2, 2022 from: bps.go.id/statistictable/2019/09/24/2072/emisi-gas-rumah-kaca-menurut-jenis-sektor-ribuan-ton-co2e-2000-2019.html.
- Choi, B., Lee, D., and Psaros, J. (2013), An analysis of Australian company carbon emission disclosures, *Pacific Accounting Review*, 25(1), 58-79.
- Detikinet. (2022). Orang Indonesia Juara Dunia Paling Tidak Percaya Global Warming. Retrieved October 31, 2022 from: inet.detik.com/science/d-6228282/orang-indonesia-juara-dunia-paling-tidak-percaya-global-warming.
- Ekonomi. (2021). Covid-19 Sebabkan Penurunan Emisi Karbon Hingga 59 Juta Ton. Retrieved November 1, 2022 from: ekonomi.bisnis.com/read/20210927/44/1447378/covid-19-sebabkan-penurunan-emisi-karbon-hingga-59-juta-ton.
- Ghozali, I. (2020). *25 Grand Theory*. Yoga Pratama.
- Hariswan, A. M., DP, E. N., & Mela, N. F. (2022). Pengungkapan Emisi Karbon Perusahaan Pertambangan di Indonesia. *Jurnal Al-Iqtishad*, 18(1), 19–41.
- Kompas. (2022). Sri Mulyani: Emisi Karbon Dunia Turun 6,4 Persen gara-gara Pandemi Covid-19. Retrieved October 31, 2022 from: money.kompas.com/read/2022/02/22/145000426/sri-mulyani-emisi-karbon-dunia-turun-64-persen-gara-gara-pandemi-covid-19.
- Laily, F. N., & Najicha, F. U. (2022). Penegakan Hukum Lingkungan Sebagai Upaya Mengatasi Permasalahan Lingkungan Hidup di Indonesia. *Wacana Paramarta Jurnal Ilmu Hukum*, 21(2), 17–26.
- Maqfirah, P. A., & Fahrianta, R. Y. (2022). Faktor-Faktor yang Memengaruhi Pengungkapan Emisi Karbon Pada Perusahaan Manufaktur yang Terdaftar di BEI Periode 2016-2020. *Prosiding National Seminar on Accounting UKMC*, 1(1), 344–356.
- Maulidiavitasari, J., & Yanthi, M. D. (2021). Pengaruh Kinerja Lingkungan terhadap Carbon Emission Disclosure dengan Dewan Komisaris sebagai Variabel Moderasi. *Akuntabilitas*, 15(1), 1–18.
- Nurlis, N. (2019). Carbon Emission Disclosure in the Proper Rating Company's Annual Financial Statements in Indonesia Stock Exchange. *Research Journal of Finance and Accounting*, 10(12), 60–66. <https://doi.org/10.7176/RJFA>.
- Pramuditya, I. D. G. N. E. C., & Budiasih, I. G. A. N. (2020). Dampak Mekanisme Good Corporate Governance pada Carbon Emission Disclosure. *E-Jurnal Akuntansi*, 30(12), 3052. <https://doi.org/10.24843/eja.2020.v30.i12.p05>.

- Pratama, Y. M. (2021). Analisis Determinan Pengungkapan Emisi Karbon di Indonesia. *MODUS*, 33(2), 120–137.
- Rahmawati, S., & Budiwati, C. (2018). Karakteristik Perusahaan, ISO 14001, dan Pengungkapan Lingkungan: Studi Komparatif di Indonesia dan Thailand. *Jurnal Akuntansi Dan Bisnis*, 18(1), 74–87.
- Riantono, I. E., & Sunarto, F. W. (2022). Factor Affecting Intentions of Indonesian Companies to Disclose Carbon Emission. *International Journal of Energy Economics and Policy*, 12(3), 451–459. <https://doi.org/10.32479/ijeep.12954>.
- Saptiwi, N. W. T. (2019). Pengungkapan Emisi Karbon: Menguji Peranan Tipe Industri, Kinerja Lingkungan, Karakteristik Perusahaan dan Komite Audit. *Jurnal Akuntansi Bisnis*, 17(2), 227–240.
- Saraswati, E., Puspita, N. R., & Sagitaputri, A. (2021). Do Firm and Board Characteristics Affect Carbon Emission Disclosure? *International Journal of Energy Economics and Policy*, 11(3), 14–19. <https://doi.org/10.32479/ijeep.10792>.
- Sekarini, L. A., & Setiadi, I. (2021). Pengaruh Leverage, Profitabilitas, Ukuran Perusahaan Dan Kinerja Lingkungan Terhadap Pengungkapan Emisi Karbon Perusahaan (Studi Empiris Pada Perusahaan Pertambangan yang Terdaftar di Bursa Efek Indonesia Periode 2014-2018). *Kompartemen: Jurnal Ilmiah Akuntansi*, 19(2), 203–212.
- Setiany, E., Hidayah, N., Zamzami, A. H., & Ahmad, Z. (2022). Government Ownership, Media Exposure and Firm Characteristics on Carbon Emission Disclosure: The Case of Indonesia Manufacturing Industry. *Review of Integrative Business and Economics Research*, 11(2), 193-203.
- Setiawan, P., Soeprajitno, R. W. N., & Iswati, S. (2019). Peran Good Corporate Governance dalam Memprediksi Emisi Gas Karbon pada Perusahaan Pertambangan. *Akuntansi Dewantara*, 3(2), 156–168. <https://doi.org/10.26460/AD.V3I2.5278>.
- Sihombing, A. T. M., & Banke, R. (2023). Politik Hukum Pengelolaan Sumber Daya Alam di Indonesia. *Jurnal Ilmiah Simantek*, 7(1), 7–15.
- Simamora, R. N. H., Safrida, S., & Elviani, S. (2022). Carbon emission disclosure in Indonesia: Viewed from the aspect of board of directors, managerial ownership, and audit committee. *Journal of Contemporary Accounting*, 4(1), 1–9. <https://doi.org/10.20885/jca.vol4.iss1.art1>.
- Suhardjanto, D., Purwanto, Ashardianti, D., & Setiany, E. (2018). Environmental Disclosure in Agricultural Sector and Consumer Goods Annual Report (Comparison between Indonesia and Malaysia). *Review of Integrative Business and Economics Research*, 7(4), 203–215.
- Trufvisa, U. S., & Ardiyanto, M. D. (2019). Pengaruh Karakteristik Dewan Komisaris Terhadap Pengungkapan Emisi Karbon. *Diponegoro Journal of Accounting*, 8(3), 1–11. <http://ejournal-s1.undip.ac.id/index.php/accounting>.

- Ummah, Y. R., & Setiawan, D. (2021). Do Board of Commisioners Characteristic and International Environmental Certification Affect Carbon Disclosure? Evidence from Indonesia. *Jurnal Dinamika Akuntansi Dan Bisnis*, 8(2), 215–228. <https://doi.org/10.24815/jdab.v8i2.21332>.
- VOA Indonesia. (2023). Emisi Karbon Dioksida Capai Rekor Tertinggi pada 2022. Retrieved March 6, 2023 from: <https://www.voaindonesia.com/a/emisi-karbon-dioksida-capai-rekor-tertinggi-pada-2022-/6989649.html>.
- Wirawan, J., & Setijaningsih, H. T. (2022). Analisis Pengungkapan Emisi Karbon Di Indonesia. *Jurnal Muara Ilmu Ekonomi Dan Bisnis*, 6(1), 235–249. <https://doi.org/10.24912/jmieb.v6i1.18398>.
- 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. <https://doi.org/10.1108/MAJ-09-2014-1087>.