R&D INTENSITY, INDUSTRIAL SENSITIVITY, AND CARBON EMISSIONS DISCLOSURE IN INDONESIA

by Einde Evana

R&D INTENSITY, INDUSTRIAL SENSITIVITY, AND CARBON EMISSIONS DISCLOSURE IN INDONESIA

Einde Evana
Accounting Department, The University of Lampung
Email: eindeevana@yahoo.co.id

Lindrianasari[1]
Accounting Department, The University of Lampung
Email: lindrianasari@feb.unila.ac.id

Rona Majidah
Accounting Department, The University of Lampung
Email: ronamajidak@gmail.com

Abstract

This study aims to examine the effect of R&D intensity and type of industry on carbon emission disclosure (CED). Measurement of carbon emission disclosure (CED) uses an index developed by Choi et al. (2013) based on the Carbon Disclosure Project (CDP). The final data from this study are 264 company observations in the 2015-2018 period, sourced from a database of companies listed on the Indonesia Stock Exchange. Testing data using OLS (multiple regression). The study found that companies with lower R&D funding tend to disclose higher carbon emissions than firms with higher R&D funding. Another finding of this study is that companies that are sensitive to carbon pollution in their operations tend to disclose higher carbon emissions, and vice versa. These results indicate that sensitive companies trying to fulfill their legitimacy to the public (stakeholders) are greater than insensitive companies.

Keywords: Carbon Emissions Disclosure, R&D intensity, Type of Industry, Industrial Sensitivity, Legitimacy Theory.

1. Introduction

At present the environmental issue is a very important topic of discussion. One of them is the topic of climate change, where the company is the biggest contributor to carbon emissions (www.mangobay.com). Based on data released by the Global Carbon Project that during 2018, there was an increase in carbon dioxide emissions around the world around 2.7 percent, of which there were 40.9 billion tons of carbon dioxide in 2018, which increased from 39.8 billion tons of carbon dioxide in

---

2017 (www.republika.co.id). Thus, it can cause harm to humans and nature itself (Liu *et al.,* 2015; Stern, 2006). This makes doubts that business plays an important role in delivering environmental performance results through production, operations and efforts to achieve product innovation and more sustainable practices (Lee, 2009; Busch and Hoffmann, 2011; Lee and Kim, 2011).

To reduce the rate of environmental damage, companies must reconsider their business practices by finding solutions to environmental damage problems and environmental externalities arising from company operations (Porter and Reinhardt, 2007). Companies are required to design activities that show environmental concern, for example by implementing environmental management systems, pollution prevention, re-use and recycling, energy efficiency, and carbon management (Lee and Min, 2015, Lindrianasari *et al.,* 2018). Kemp and Pearson (2008) refer to innovative programs related to environmental management as eco-innovation that is defined as the production, exploitation of a product, production process, management or business methods that are new to the organization and that produce, throughout its life cycle, in reducing environmental risk, pollution and other negative impacts from resource use. The company must carry out environmental innovation by adopting methods to achieve environmental performance including the reduction of carbon emissions and a superior economy (Dangelico and Pujari, 2010). Choudhury, Salim, Al Bashir, and Saha (2013) suggested in their research that companies need to hold open dialogue and communication between stakeholders to develop cooperation that can help companies develop new green products. These studies show the efforts made by companies to reduce the rate of environmental damage.

Some manufacturing have made environmental innovations by trying to develop green products or production that are supported by increased operational and energy efficiency (Dangelico and Pujari, 2010). These environmental innovations are closely related to the company's investment in Research and Development (hereinafter referred to as **R&D**). Porter and van der Linde (1995) and McWilliams and Siegel (2000) provide empirical evidence that Corporate Social Responsibility (hereinafter referred to as **CSR**) is positively related to R&D intensity. The findings of McWilliams and Siegel (2000) are inline with the results of McWilliams and Siegel's (2000, 2001) research, Berrone *et al.* (2007), Hull and Rothenberg (2008), Bouquet and Deutsche (2008), Prior *et al.* (2008), and Lee and Min (2015), Berrone *et al.* (2007), Hull and Rothenberg (2008), Bouquet and Deutsche (2008), McWilliams and Siegel (2000, 2001), Prior *et al.* (2008), and Lee and Min (2015) find related variables when studying the impact of CSR or environmental performance and other variables.

This study offers the concept of R&D intensity to further investigate the company's environmental activities. Using industry type variables, this study predicts that environmentally sensitive companies will allocate higher R&D funds to produce sustainable and environmentally friendly products to participate in

reducing carbon emissions. Whereas companies that are not sensitive may undertake lower R&D activities in line with the negative impact the company has on the environment. Research Choi *et al.* (2013) found empirical evidence that industry type influences Carbon Emission Disclosure (hereinafter referred to as **CED**), while Ghomi and Leung (2013) found no effect. Because only a few specifically studied the direct impact of R&D on carbon emissions, this study aims to study the effect of R&D intensity on CED by including industry type as a moderating variable as a development from previous research that generally discusses environmental performance.

The study found that companies with lower R&D funding tend to disclose higher carbon emissions than firms with higher R&D funding. In addition, this study also found that companies sensitive to carbon pollution in their operations tend to disclose higher carbon emissions, and vice versa. These results indicate that sensitive companies trying to fulfill their legitimacy to the public (stakeholders) are bigger than insensitive companies.

This paper also discusses the theoretical basis and hypothesis development in the literature review. Theories that become the basic assumptions of research, such as Resource-Based View theory and Signaling theory, are described in this section. The research method discusses the population and sample, and the definition and measurement of variables is discussed in the next section. The results and discussion explain the results of the statistical testing and confirm the hypotheses built in this study. At the end of this paper a conclusion and suggestions for further research are given.

2. Literature Review

2.1. Theoretical Basis

Resource-Based View (hereinafter referred to as RBV) Theory
Basically the RBV theory states that a company's competitive advantage lies in heterogeneous resources which have the characteristic of being valuable, expensive to emulate, and cannot be substituted (Barney, 1991; Hart, 1995). However, the RBV is felt to be lacking in explaining how to use resources to achieve competitive advantage in a changing external environment (DeSarbo *et al.*, 2005). Given the changing market pressures and stakeholder influences related to the natural environment, the RBV has limits in explaining how to improve business performance related to the natural environment. In the issue of carbon emissions, the RBV can explain the use of company resources in reducing the impact of carbon emissions resulting from the production process. One of them is by conducting various research and development (R&D) activities to carry out production processes that are low in burning fossil fuels, and produce environmentally friendly products. Various resources can be used by companies in R&D, from the expertise of existing human resources, available assets, and funds

3

owned, a heterogeneous component of resources that is very valuable to the company. Therefore, R&D intensity is an important observation variable using the basic assumptions of the RBV theory.

Signaling theory
Signaling theory suggests that managers have information to signal the information. The theory introduced by Ross (1977) that expected to provide managerial incentives and financial structure when information signals are released to the market. Information given by the company to the market creates a competitive equilibrium on the company's market performance, because the market will validate that information. The more efficient a market is, the more precise and faster the reaction is to the information released by the company.

Discussion of signaling theories for voluntary disclosure areas is currently gaining more attention. Callery and Perkins (2020) explain that the lack of audit and evaluative oversight of company disclosures has created incentives for adopting misleading disclosure modes. During this time, all disclosures reported by the company were taken for granted by the market even though in some studies no significant reaction was found to the information. The researchers were not able to assess the extent to which voluntary disclosure could be verified in honesty so as to guarantee the company's credibility in the long run. Therefore, observing financial information in audited financial statements will provide reliable information compared to only disclosure information.

Carbon emissions
Carbon emissions are gases emitted from combustion of compounds containing carbon, for example, carbon dioxide (CO_2), methane (CH_4), dinitrooxide (N_2O), and chlorofluorocarbons (CFC) (Riebeek, 2010). The Government of Indonesia is also committed to supporting the protection of the environment and also maintaining a stable surface temperature of the earth below 2 degrees Celsius. Presidential Regulation Number 61 of 2011 concerning the national action plan for reducing greenhouse gas emissions (RAN-GRK) and Presidential Regulation Number 71 of 2011 concerning the implementation of a national greenhouse gas inventory (www.ksp.go.id). Therefore the company is expected to participate in efforts to reduce carbon emissions by conducting eco-innovation in its business practices, as well as the courage to disclose environmental information in Carbon Emission Disclosure (CED) which is one example of environmental disclosure which is part of an additional report that has been stated in PSAK No. 1 (Revised 2009) paragraph twelve which states that an entity may present, separate from financial statements, environmental reports and value added reports.

Research and Development (R&D)
R&D is considered as an investment that can increase knowledge, so that the company's long-term performance can increase and can affect the value of the company through improvements and innovations in both its processes and

products (Padgett and Galan, 2010). In addition, it can also increase their productivity (McWilliams and Siegel 2000). This supports many opinions that R&D is one of the competitive advantage strategies that can be used by companies. Hull and Rothenberg (2008) argue that CSR is a strategy used to differentiate companies from competitors so that the company will gain a competitive advantage.

Type of Industrial
Companies in sensitive industries will produce more emissions than non-sensitive industrial companies. Companies operating in the intensive industry are generally in the energy, transportation, materials and utilities sector (Choi *et al.,* 2013). The classification refers to the Global Industry Classification Standard (GICS) model. GICS is a global standard in categorizing companies in sectors and industries and designing company classifications based on their main business activities

2.2. Hypothesis development

R&D intensity and Carbon Emission Disclosure (CED)
Gutowski *et al.* (2005) explain that the company's current environmental performance is used as a measure of the company's success in reducing its impact on the environment. Environmental performance referred to here includes efficient use of resources, reduction of waste and energy consumption, and reduction of environmental risks including the reduction of carbon emissions (Aragon-Correa *et al.,* 2008). Therefore it is necessary to do innovative actions, using environmentally friendly technology to reduce pollution and carbon emissions (Lee and Min, 2015). The relationship between the quality and volume of carbon emission disclosure (CED) was also found to be significant in British higher education institutions (HEIs) (Saha, Saha, Choudhury, and Jie, 2019). The study of Saha, Saha, Choudhury, and Jie (2019) at Higher Education Institutions (HEIs) shows that CED needs to be clearly disclosed to HEIs. Although there are definitely differences with profit-seeking companies, CED must be seen in the education industry disclosers. Saha *et al.* (2019) suggest that future research should investigate the impact of CED volume and quality on reputation.

The long-term commitment of the company also needs to be done to adopt eco-innovation, especially in the form of research and development (R&D), which aims to identify production, environmental technology, improve energy efficiency and at the same time lead to the innovation of environmentally friendly products (Melynk *et al.,* 2003; Sambasivan *et al.,* 2013). Because based on RBV theory, to maintain the natural environment and achieve long-term success the company needs to accumulate resources and manage capabilities with a long-term focus rather than a short-term focus. This theory highlights the relationship between environmental strategies, green capabilities, and competitiveness at the company level (Hart, 2005; Hart and Dowell, 2011). As revealed by Lee and Min (2015) R&D activities in the environment seek to increase productivity and efficiency as well as

reduce costs and environmental impacts, such as reducing energy consumption and carbon emissions reflected in CED. For companies that actively conduct R&D related to the environment, it becomes a positive signal for the market when they disclose this activity to the public. Therefore, the higher the intensity of R&D, the higher the tendency for companies to disclose carbon emissions. It is also a company as a form of corporate response to legitimacy, and consequently the company will get a positive response from stakeholders.

Studies by Arora and Cason (1996) show a positive relationship between R&D expenditure and environmental management systems, but R&D and pollution emissions are negatively related (Cole *et al.*, 2005). McWilliams and Siegel (2000) prove that CSR is positively related to R&D. Meanwhile, Padgett and Galan (2010) found that R&D intensity had a positive effect on CSR and that the relationship was significant in the manufacturing industry, whereas in the non-manufacturing industry it had no effect.

Referring to the research of Lopez-Gamero *et al.* (2009), investment and the intensity of environmental problems will have an impact on the application of proactive environmental management to help improve the company's environmental performance. R&D activities need to be carried out in response to environmental issues, especially regarding carbon emissions. Industries that are intensive or sensitive to the environment are required to have higher R&D activities to reduce carbon emissions (Padget and Gallan, 2010), so that sensitive companies are under greater pressure (Choi *et al.*, 2013). The positive relationship between the intensity of R&D and CED indicates the company's efforts in environmental responsibility, by reducing the level of environmental problems, including ozone depleting chemicals, substantial emissions and climate change reflected in the CED. Based on the synthesis above, the hypothesis formulation related to the intensity of R&D and CED is:

H1: R&D intensity has a positive effect on Carbon Emission Disclosure (CED)

Industrial Type and Carbon Emission Disclosure (CED)
Research on the disclosure of carbon emissions as a development of environmental performance is still small and the results are still inconclusive. This research bridges the relationship by including industry type variables to see whether when an intensive company produces carbon emissions will carry out activities in an effort to reduce carbon emissions which is reflected in the disclosure of carbon emissions. A study conducted by Choi *et al.* (2013) explains that there are two types of industries namely intensive and non-intensive in producing carbon emissions. Intensive industries are assumed to have a greater responsibility for the environment than non-intensive industries (Brammer and Pavelin, 2006).

6

On the other hand, non-intensive companies are considered to be less sensitive to carbon emissions, such as banking, property development, and retail (Choi *et al.*, 2013) so that they have less R&D activities and less disclosure of carbon emissions. The findings of Choi *et al.* (2013), and Van De Burgwal and Vieira (2014) found that the type of industry influences the disclosure of carbon emissions. So the next hypothesis formulation is:

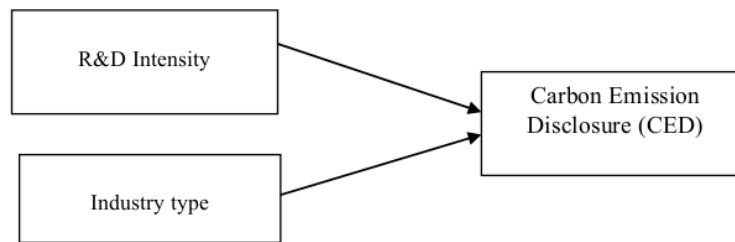**H2: Industry type has a positive effect on Carbon Emission Disclosure (CED)**

Fig. 1 Research Framework

3. Research Methodology

3.1 Population and sample

The sampling method in this study is all the population of companies that are located in the Indonesia Stock Exchange. The sample selection criteria used were all companies that had the required data in this study. The data collection method uses the hand-collected method, through tracking company annual reports obtained on the company's own website and / or the Indonesia Stock Exchange website. Observations made in this study for the 2015-2018 period. Companies that have R&D data and disclose carbon emissions in financial reports during the study period are all objects of research. The analysis technique used in this research is Multiple Regression Analysis, for testing Hypothesis 1 and Hypothesis 2.

3.2. Research variable
3.2.1. Independent Variable

R&D intensity
The intensity of research and development (R&D) can be measured by dividing the total R&D expenditure by total sales (see Padget and Galan, 2010). However, in this study the intensity of R&D refers to the research of Lu *et al.* (2010) which divides the research and development burden on the total assets of the company.

$$R\&D = \frac{R\&D\ Expense}{Total\ Assets}$$

Industrial Type

Industrial types are divided into two categories namely sensitive and insensitive industries. Sensitive industries, those industries whose operations produce carbon emissions, vice versa. The type of industry is measured by a dummy variable where the industry which is intensive in producing carbon emissions is given a value of 2 while the non-intensive industry is given a value of 1.

3.2.2. Dependent Variable
Carbon Emissions Disclosure (CED)

Carbon emissions disclosure is measured using an index developed by Choi *et al.* (2013 as shown at table 1. The assessment is done by checking the index on the Carbon Disclosure Project (CDP) information request sheet. If the company discloses the items as specified, a score of 1 will be given, whereas if the specified item is not disclosed, it will be given a score of 0. If the company discloses in full, a score of 1 will be obtained and then the company's total CED value is divided by the total CED index (ie 18 points), so that the final value for this variable will be obtained by adopting a ratio.

Table 1
Carbon Emission Disclosure Index

Category	Item	Description
Climate change	CC1	Assessment/ description of risks related to climate change and the actions taken or actions to be taken to address the risks.
	CC2	Current (and future) assessment/ description of the financial implications, business implications, and opportunities of climate change
Calculation of GHG Emissions	GHG1	Description of the methodology used to calculate (calculate) GHG emissions (Greenhouse gases)
	GHG2	Existence of verification from external parties in measuring the amount of GHG emissions
	GHG3	Total GHG emissions produced
	GHG4	Disclosure of scope 1 and 2, or scope 3 of GHG emissions
	GHG5	Disclosure of GHG emission sources
	GHG6	Disclosure of facilities or segments of GHG
	GHG7	Comparison of GHG emissions with the previous year
Energy consumption	EC1	Total energy consumed
	EC2	Quantification of energy used from renewable sources
	EC3	Disclosures by type, facility or segment
GHG costs and reductions	RC1	A detailed plan or strategy to reduce GHG emissions

	RC2	The specifications of the target level / level and year to reduce GHG emissions [2]
	RC3	Emission reductions and costs or savings achieved today as a result of carbon emission reduction plans
	RC4	Costs of future emission costs calculated in capital expenditure planning [2]
Accountability for Carbon Emissions	ACC1	Indications from the committee of the committee responsible for actions related to climate change
	ACC2	Description of the mechanism by which the board reviews the company's progress on climate change

Source: Choi et al. (2013)

Data Analysis Method

The analysis technique in this study began with descriptive analysis and statistical analysis. Descriptive statistical analysis is used to provide an overview of the research variables regarding the phenomenon or characteristics of the data. Then the classic assumption test is performed to ensure that the data used is feasible using OLS test equipment. Multiple regression analysis is used for testing Hypothesis 1 and Hypothesis 2 in this study.

$$CED = \alpha + \beta_1 R\&D + \beta_2 IT + \varepsilon$$

CED	= Carbon Emissions Disclosure
R&D	= Intensitas R&D
IT	= Industry Type
α	= Constanta
$\beta_1, \beta_2, \beta_3$	= Regression Coefficient
e	= Error

4. Results and Discussion

The final data of this study were 264 companies in the 2015-2018 observation period. This research has not been able to enter data in 2019 due in April 2020 the data is not available. Existing company data is processed using multiple linear regression because it suffices for large sample requirements. Table 2 shows the descriptive statistics of the data used in this study.

4.1. Descriptive Statistics

Table 2 shows the mean values for costs associated with research and development in reducing carbon emissions released by companies. Value of 0.3%

shows the comparison of R&D costs with the total assets owned by the company. This data shows the low intensity of companies in conducting research and development related to carbon reduction. The low value of the intensity of research and development can also be due to the lack of detail in disclosing research and development funds related to carbon emissions reductions. This is due to the absence of mandatory rules that require companies to disclose information on carbon emissions, environmental costs, and the like (see Lindrianasari *et al.,* 2018). In research conducted by Lindrianasari (2018) found low disclosure by companies in Indonesia related to costs relating to environmental transactions compared to other countries in the ASEAN region (ie Malaysia and Thailand).

Table 2
Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
RnD_Intensity	0	0.34	0.0036	0.03095	264
Industry	1	2	1.822	0.38326	264
CED	0.09	1.55	0.5487	0.36709	264
Valid N (listwise)					264

Source: Secondary data on company financial statements. Processed 2020

Tabel 3
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.234[a]	0.055	0.048	0.21776

a. Predictors: (Constant), Industry, RnD_Intensity

b. Dependent Variable: CED

Table 4
Model Testing

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.72	2	0.36	7.592	.001[b]
	Residual	12.376	261	0.047		
	Total	13.096	263			

a. Dependent Variable: CED

b. Predictors: (Constant), Industry, RnD_Intensity

The results of the model summary (table 3) show the value of the relationship of this research variable at a value of 0.234 This figure shows that the independent variable of this study has a relationship of 23.4% on the dependent variable. For the research model, a score of 0.001 (<0.05) is obtained which indicates that the research model is good and can be continued to test the hypothesis (see table 4).

4.2. Results of hypothesis testing and discussion

There are two hypotheses that were built in this study. The first hypothesis states that R&D intensity has a positive effect on Carbon Emission Disclosure (CED). Meanwhile, the second hypothesis states that industry type has a positive effect on Carbon Emission Disclosure (CED). Table 5 shows the hypothesis testing. Each will be explained below with the results of the statistical test as follows.

R&D intensity has a positive effect on Carbon Emission Disclosure (CED).

The results of testing the first hypothesis are in line with the research findings of Cole *et al.* (2005) who found that R&D is negatively related to pollution emissions. Statistical test produces a t-value of -0.184 with a significance of 0.854. This value indicates that companies that have low intensity of allocation of R&D funds tend to disclose information on higher carbon emissions compared to companies with higher intensity of R&D fund allocation. These results also indicate that companies with R&D intensity in reducing carbon emission levels tend to try to provide information on higher carbon emissions, vice versa. The significance value of 0.854 indicates that there is no significant influence on the negative effect between R&D intensity on Carbon Emission Disclosure (CED). These results also at the same time place the first hypothesis of this study that cannot be supported.

Table 5
Hypothesis Testing

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	0.088	0.065		1.345	0.18
1	R&D Intensity	-0.08	0.435	-0.011	-0.184	0.854
	Industry	0.137	0.035	0.235	3.896	0

Source: Secondary data on company financial statements. Processed 2020.

However, the truth of the disclosure of carbon emissions can be trusted? Until now, researchers have not been able to assess the extent to which voluntary disclosure can be verified in honesty so as to guarantee the company's credibility in the long run. The study by Callery and Perkins (2020) explains that the lack of audit oversight and evaluation of company disclosures has created incentives to engage in misleading disclosure modes. All this time, all disclosures reported by the company have just been accepted by the market, without the power to trace the truth of disclosures released by the company. This explanation is in line with the signaling theory introduced by Ross (1977). Where managers have the urge to signal the information they have. This information is expected to provide managerial incentives and financial structure when information signals are

released to the market, especially when companies are faced with information that is less profitable on the other side (in this case the low intensity of R&D).

Industrial type has a positive effect on Carbon Emission Disclosure (CED)
Industries whose operations are sensitive to the creation of carbon pollution are thought to have a big push to disclose carbon emissions. The test results for this hypothesis indicate a t-value of 3,896 with a significance of 0,000. This value indicates that companies that in their activities will produce high carbon pollution tend to disclose information on higher carbon emissions, compared to companies that are not sensitive. This result also shows that sensitive companies try to fulfill their legitimacy to the community. This result also supports the second hypothesis of this study states that the type of industry has a positive effect on Carbon Emission Disclosure.

The results of this study support studies conducted by previous researchers. Brammer and Pavelin (2006), Choi, et al. (2013), and Van De Burgwal and Vieira (2014) are some researchers who find that industries that are sensitive to the environment tend to disclose higher carbon emissions. This finding is also in line with the theory of legitimacy which demands a match between the company's activities and the community's needs. If the company which in its activities produce high carbon pollution, the environment around it will demand the activities of companies that can reduce the pollution. The company has responded to this demand through disclosure, one of which is related to the disclosure of carbon emissions.

5. Conclusions and suggestions

This study concludes that companies with lower intensity of R&D fund allocation tend to disclose information on higher carbon emissions compared to companies with higher R&D fund allocation intensity. This finding can be explained by using the basic assumptions offered by the signaling theory in which managers have the urge to give a signal of positive information that they have to cover up other information that is less profitable for the company. The information released is expected to provide managerial incentives and financial structure to the company. In addition, this study also concludes that companies that are sensitive to produce carbon pollution in operational activities tend to disclose higher carbon emissions, vice versa. These results indicate that sensitive companies try to fulfill their legitimacy to the environment.

This research has taken great care in collecting data, especially those related to voluntary disclosure of carbon emissions. However, as some researchers are concerned in the field of voluntary disclosure studies, as long as there are no audits and assessments or disclosures, companies may choose misleading disclosure modes. This is a major limitation of this type of research that is very

difficult for all researchers to avoid. This research offers important implications for further researchers, namely to always side the numbers of financial statements that have been audited by reputable public accounting firms, in any research related to any voluntary disclosure. Because, if the voluntary disclosure made by the company has a biased variance, then the resulting research still contains reliable information on the audited financial statement figures.

Acknowledgment

References

Aragon-Correa, A., Hurtado-Torres, N., Sharma, S., & García-Morales, J. (2008). Environmental strategy and performance in small firms: a resource-based perspective. *Journal Environment Management* 86(1): 88-103.

Arora, S., & Cason, T. (1996). Why do firms volunteer to exceed environmental regulations? Understanding participation in EPA's 33/50 program. *Land Economic* 72(4): 413-432.

Barney, J.(1991). Firm resources and sustained competitive advantage. *Journal Management* 17(1): 99-120.

Berrone, P., J. Surroca., & J. A. Tribo. (2007). Corporate Ethical Identity as a Determinant of Firm Performance: A Test of the Mediating Role of Stakeholder Satisfaction. *Journal of Business Ethics* 76: 35–53.

Bouquet, C. & Y. Deutsche. (2008). The Impact of Corporate Social Performance on a Firm's Multinationality. *Journal of Business* Ethics 80: 755–769.

Brammer, S. & S. Pavelin. (2006). Corporate Reputation and Social Performance: The Importance of Fit. *Journal of Management Studies,* 43(3): 435-455.

Busch, T. & Hoffmann, V. (2011). How hot is your bottom line? Linking carbon and financial performance. *Business Social* 50(2): 233-265.

Choi, B. B., Lee, D., & Psaros, J. (2013). An Analysis Australian Company Carbon Emission Disclosures. *Pacific Accounting Review* 25:58-79.

Choudhury, T. T., Salim, M., Al Bashir, M., & Saha, P. (2013). Influence of stakeholders in developing green banking products in Bangladesh. *Accounting* 4(7): 67-77.

Cole, M., Elliott, R., & Shimamoto, K. (2005). Industrial characteristics, environmental regulations and air pollution: an analysis of the UK

manufacturing sector. *Journal of Environmental Economic Management* 50: 121-143.

Dangelico, R. & Pujari, D. (2010). Mainstreaming green product innovation: why and how companies integrate environmental sustainability. *Journal of Business Ethics* 95(3): 471-486.

DeSarbo, W., Benedetto, C., Song, M., & Sinha, I. (2005). Revisiting the miles and snow strategic framework: uncovering interrelationships between strategic types, capabilities, environmental uncertainty, and firm performance. *Strategic Management Journal* 26(1): 47-74.

Ghomi, B. L. & Leung, P. (2013). An Empirical Analysis of the Determinants of Greenhouse Gas Voluntary Disclosure in Australia. *Accounting Finance Research* 2(1): 1-18.

Gutowski, T., Murphy, C., Allen, D., Bauer, D., Bras, B., Piwonka, T., Sheng, P., Sutherland, J., Thurston, D., & Wolff, E. (2005). Environmentally begin manufacturing: observations from Japan, Europe and the United States. *Journal of Clean Production* 13(1): 1-17.

Hart, S. L. (2005). Innovation, creative destruction and sustainability. *Research of Technology Management* 48(5): 21-27.

Hart, S. L. & Dowell, G. (2011). A natural-resource-based view of the firm: fifteen years after. *Journal of Management* 37(5): 1464-1479.

Hart, S.L. (1995). A natural-resource based view of the firm. *Academy of Management Review* 20(4): 98-113.

Hull, C. E. & Rothenberg, S. (2008). Firm performance: The interactions of corporate social performance with innovation and industry differentiation. *Strategic Management Journal* 29(7): 781–789.

Kemp, R. & Pearson, P. (2008). Final Report MEI Project about Measuring Ecoinnovation: Deliverable 15 of MEI Project (D15). *Project report,* available at: http://www. oecd.org/greengrowth/consumption-innovation/43960830.pdf).

Lee, K. H. (2009). Why and how to adopt green management into business organizations? The case study of Korean SMEs in manufacturing industry. *Management Decision* 47(7): 1101-1121.

Lee, K. H. & Kim, J. (2011). Integrating suppliers into green product innovation development: an empirical case study in semiconductor industry. *Business Strategy and the Environment* 20(8): 527-538.

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* (2015):1-9.

Lindrianasari, M. Kufepaksi Y. Asmaranti, A. Komalasari (2018). Social and Environmental Responsibility in Developing Countries: A Theoretical Approach to Regulation. *International Journal of GEOMATE* 15(49): 47-52.

14

Liu, Y., Zhou, Z., Zhang, X., Xu, X., Chen, H, & Xiong, Z. (2015). Net global warming potential and greenhouse gas intensity from the double rice system with integrated soil-crop system management: A three-year field study. *Atmospheric Environment* 116: 92-101.

Lopez-Gamero, M., Molina-Azorín, J., & Claver-Cortes, E. (2009). The whole relationship between environmental variables and firm performance: competitive advantage and firm resources as mediator variables. *Journal of Environmental Management* 90(10): 3110-3121.

Lu, Y. H., Tsai, C. F., & Yen, D. C. (2010). Discovering Important Factors of Intangible Firm Value by Association Rules. *The International Journal of Digital Accounting Research* 10: 5-85.

McWilliams, A. & Siegel, D. (2000). Corporate social responsibility and financial performance: correlation or misspecification? *Strategic Management Journal* 21(5): 603-609.

McWilliams, A. & Siegel, D. (2001). Corporate Social Responsibility: A Theory of the Firm Perspective. *The Academy of Management Review* 26 (1): 117-127.

Melnyk, S.A., Sroufe, R.P., & Calantone, R. (2003). Assessing the impact of environmental management systems on corporate and environmental performance. *Journal of Operating Management* 21: 329-351.

Padgett, R.& Galan, J. (2010). The effect of R&D intensity on corporate social responsibility. *Journal of Business Ethics*, 93, 407-418.

Callery, Patrick and Perkins, Jessica L.. (2020). Detecting False Accounts in Intermediated Voluntary Disclosure. *Academy of Management Discoveries*. In-press. Published Online: 13 Jan 2020https://doi.org/10.5465/amd.2018.0229

Porter, M., Reinhardt, F. (2007). A strategic approach to climate. *Harvard Business Review* 85(10): 22-26.

Porter, M., van der Linde, C., 1995. Towards a new conception of environment competitiveness relationship. *Journal of Economic Perspectives* 9(4): 119-132.

Prior, D., Surroca, J., & Tribó, J. A. (2008). Are socially responsible managers really ethical? Exploring the relationship between earnings management and corporate social responsibility. *Corporate Governance: An international review* 16(3): 160-177.

Riebeek, H. (2010). Global Warming. Quoted on August 4, 2018, from Earth Observatory Nasa Web site: http://earthobservatory.nasa.gov/Features/GlobalWarming.

Ross, Stephen. (1977). The Determination of Financial Structure: The Incentive-Signalling Approach. *Bell Journal of Economics* 8(1): 23-40.

Saha, A.K., Saha, B., Choudhury, T. and Jie, F. (2019). Quality versus volume of carbon disclosures and carbon reduction targets: Evidence from UK higher education institutions. *Pacific Accounting Review* 31(3): 413-437.

Sambasivan, M., Bah, S., & Jo-Ann, H. (2013). Making the case for operating "Green": impact of environmental proactivity on multiple performance outcomes of Malaysian firms. *Journal of Clean. Production* 42: 69-82.

Stern, N. (2006). *The Stern review on the economics of climate change*. Cambridge: Cambridge University Press.

Van De Burgwal, D., and Vieira, R.J.O. (2014). Environmental Disclosure Determinants in Dutch Listed Companies. *Revista Contabilidade & Finanças* 25(64): 60-78.

www.ksp.go.id

www.mangobay.com

www.republika.co.id

R&D INTENSITY, INDUSTRIAL SENSITIVITY, AND CARBON EMISSIONS DISCLOSURE IN INDONESIA

Exclude quotes	Off		Exclude matches	< 1%
Exclude bibliography	On			

R&D INTENSITY, INDUSTRIAL SENSITIVITY, AND CARBON EMISSIONS DISCLOSURE IN INDONESIA

FINAL GRADE

/0

GENERAL COMMENTS

Instructor