Original Research paper

DETERMINANTS OF CARBON EMISSION DISCLOSURE IN INDONESIA MANUFACTURING COMPANY

ABSTRACT (ARIAL, BOLD, 11 FONT, LEFT ALIGNED, CAPS)

Abstract

Climate change is caused by increasing carbon emissions and this become a global concern. Indonesia, as a significant carbon emitter, is expected to reduce carbon emissions. This study examines the factors that cause companies to disclose carbon emissions, with a sample of manufacturing companies in Indonesia, for 2016-2018. The number of samples obtained was 108 firm years. The results showed that the determinants for companies to disclose carbon emissions were profitability, type of industry and company size. This means that the higher the profitability and size of the company, the wider the disclosure of carbon emissions. Industry types are classified as high profile and low profile, in relation to contributors to carbon emissions. The higher the profile, the wider the disclosure will be, due to pressure from stakeholders. This supports the legitimacy theory. The leverage factor does not cause the company to make disclosures. This is because companies with high leverage tend to lower costs. In addition, the carbon emission disclosure report is still voluntary, so the company only discloses what is mandatory. The banking industry is required to prepare a sustainability report for 2019, so further research can use banking industry objects.

Keywords: *Carbon emission disclosure, profitability, industrial type, size, and leverage*

1. INTRODUCTION

Climate change is an issue that is attracting international attention. The United Nations Framework Convention on Climate Change (UNFCCC) explains that climate change from year to year occurs due to human activities, either directly or indirectly which can change the world's atmosphere (Intergovernmental Panel on Climate Change at www.ipcc.ch). Greenhouse gases increased significantly, especially in the 90s.The increase in emission gases led the United Nations to form the Intergovernmental Panel on Climate Change (IPCC) and issue the Kyoto Protocol at an international conference as an instrument to stabilize GHG concentrations that have been ratified by at least 55 members. The Kyoto Protocol applies three mechanisms, namely Emission Trading (ET), Clean Development Mechanism (CDM), and Joint Implementation (JI). The renewal of the 1997 Kyoto Protocol

30   agreed at the 21st Conference of Parties (COP) with the 2015 Paris Agreement, which
31   shows the world's countries' commitment to maintaining the limit of the increase in earth's
32   temperature below 2°C. Therefore, company world today focuses on green practices to be
33   attentive to the conservation of the environment and to environmentally sustainable facilities
34   and goods (Ahmed et al.,2019).
35
36   Indonesia is the fifth emitter of carbon globally, mainly from forest fires and carbon-rich
37   peatlands, but carbon emissions are still classified as a voluntary disclosure. The importance
38   of disclosing carbon emissions is expected to push companies to be more transparent about
39   environmental information so that stakeholders can monitor the extent to which companies
40   care about climate change. Company management will be pressured to evaluate climate
41   change concerns, including company policies. The carbon report is a company strategy that
42   can retain its legitimacy (Pellegrino &Lodhia, 2012).
43
44   Therefore, carbon reports are still voluntary in several countries, so they do not have a
45   standard and cause differences in disclosure. Several factors influence the carbon report
46   itself. Firm size has a major influence on disclosure of carbon emissions (Lorenzo,et al.,
47   2009; Gonzalez, 2016; Majid &Gozali, 2015; Choi, Lee, & Psaros, 2013; Ghomi& Leung,
48   2013; Freedman &Jaggi, 2005). Tang and Luo (2016) addedthatoutof 243 companies in
49   theworld,   around   74%   carriedouttransparency   in
50   carbonemissiondisclosuresinfluencedbyfirmsize, leverage, and industrytype. In contrast, Chu
51   et. al (2013), forcompanies in China, profitabilitycannotincreasecarbonemissionsdisclosure.
52   Otherstudieshavefoundthatleverage (Hapsoro&Ambarwati, 2018) and companysize
53   (Hanifah, 2017) do notaffectcarbonemissions' disclosures.
54
55   Thisstudyaimsto   determine   thefactorsthat   can   improvecompanies'
56   reportingofcarbonemissionsbydistinguishinghighprofile   and
57   lowprofilecompaniesconnectedwithresearchresultsthat   are   inconsistent   and
58   havebeendescribedabove.
59   Thecontributionofthisresearchistoprovideknowledgerelatedtogreenhouse gas emissions and
60   toencouragecompaniesto   reduce   carbonemissions,   as   well   as
61   theirimplicationsforlegitimacytheory.
62   Forpolicymakersitisconsiderationforrequiringregulationrelatedtocarbonreporting as well as
63   sustainabilityreporting.
64
65
66
67   **2. LITERATURE REVIEW**
68
69   **2.1 Legitimacytheory**
70
71   Legitimacy theory is a theory that is often used to explain the motivation of company
72   management to implement CSR. Legitimacy is defined by Lindblom (1994) as a condition or
73   status in which the entity's value system is in line with the social value system in which the
74   company operates. The organization tries to align its goals and operations with the values
75   and norms that apply in society (Harsanti, 2011), with the hope that the company can
76   continue to operate. Therefore, a "social contract" is created between the business and the
77   community (Muttakin et al., 2018).
78
79   Based on the legitimacy theory, CSR is seen as a tool to achieve legitimacy, so that the
80   continuity of the company's operations is maintained (Cho et al., 2010). This theory may
81   explain why CSR projects are carried out by business according to community demand. The
82   CSR activities carried out by companies are often only symbolic or only aimed at influencing

83 people's perceptions without any real contribution (Deegan, 2002; Michelon et al.,2014).
84 CSR activities will be disclosed in an annual report or sustainability report, while carbon
85 emission reports are part of it.
86
87 **2.2 CarbonEmission**
88
89 Emissions are substances, energy and/or components resulting from activities that either
90 have and/or do not have the potential as elements of air pollutants. According to the big
91 Indonesian dictionary, carbon emissions are charcoal in the form of a gas without color and
92 heavier than air. So, carbon emissions are carbon gas compounds that are produced from
93 activity and have the potential to pollute the air. Based on data from Our World in Data, the
94 largest contributors to carbon emissions are the United States, China, and Europe, while the
95 sectors that have the largest contribution to carbon emissions come from energy, industry,
96 waste, transportation, land use sources, and agriculture.
97
98 The high carbon emission due to the company's activities has made stakeholders hope for
99 handling action from the company. Therefore, the company carries out carbon emission
100 disclosures as an accountability effort. In Indonesia itself, addressing climate change due to
101 increased carbon emissions has been regulated in Law Number 16 of 2016 concerning
102 Ratification of the Paris Agreement to The United Nations Framework Convention on
103 Climate Change, Presidential Regulation Number 71 of 2011 concerning Implementation of
104 National Greenhouse Gas Inventories, and Presidential Regulation Number 61 of 2011
105 concerning the National Action Plan for Reducing Greenhouse Gas Emissions.
106
107 This is the basis for the emergence of carbon accounting with Green Business's thought to
108 Green Accounting. Carbon accounting is used to monitor, measure, and report on industrial
109 activities regarding GHG emissions in a certain period (Carbon Accounting, at
110 www.carbonaccounting.net.au). The implementation of carbon accounting is contained in the
111 carbon disclosure project (CDP) as an effort to take responsibility for the company to the
112 environment and / or climate. CDP has two main objectives, namely to inform investors
113 (shareholders) of climate change and to inform the company's climate change risks
114 (Stanny& Ely, 2008 in Depoers, Jerome, &Jeanjean, 2014). There are five broad categories
115 relevant to climate change and carbon emissions, namely the risks and opportunities of
116 Climate Change / CC, GHG emissions (Greenhouse Gas / GH), Energy Consumption / EC,
117 GHG reduction and costs / RC, as well as Accountability of Emission Carbon / AEC (Choi et.
118 al, 2013).
119
120 **2.3 Conceptual Framework**
121
122 Carbon emission disclosure (CED) is a disclosure of the intensity of greenhouse gas
123 emissions, energy use, emission trading schemes, strategies related to climate change, and
124 efforts to reduce emissions (Cotter and Najah, 2012). Disclosure of carbon emissions is a
125 voluntary disclosure in nature, while the increase in carbon emissions in the world is very
126 worrying.
127 Several factors, namely profitability, company size and type of industry cause companies to
128 make efforts to disclose carbon emissions more widely (Choi et al., 2013; Chu et al., 2013;
129 and Faisal et al., 2018). Conversely, there are some researchers who find leverage has an
130 effect (Faisal et al., 2018) and other findings cannot increase carbon emission exposure
131 (Ghomi and Leung, 2013). Therefore, the conceptual framework can be described as
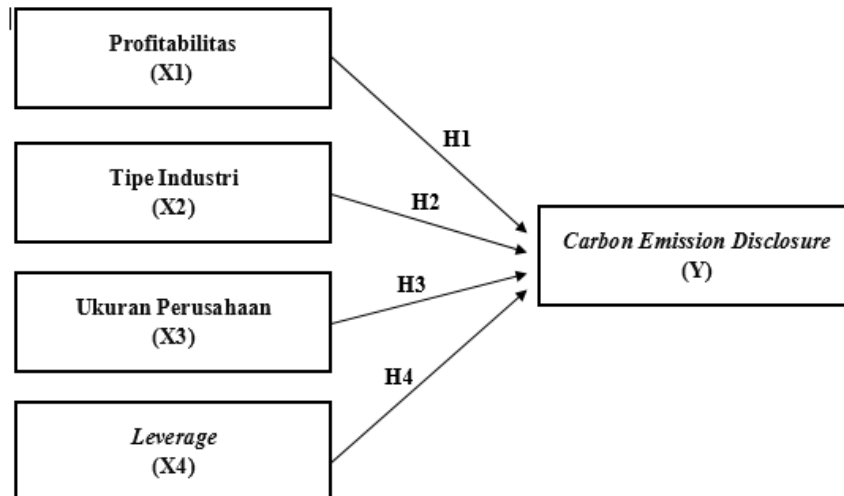132 follows:
133

Figure 1. Conceptual Framework

2.3.1. Relationship of Profitability and Disclosure of Carbon Emissions

Profitability is the company's ability to make a profit. Companies with high profitability have good prospects ahead because it shows efficient management (Faisal, 2018). Previous research has hinted that profitability has a significant link to the disclosure of carbon emissions (Faisal, 2018; Hermawan, Aisha, Gunardi, & Putri, 2018; Ismail, Rahman, &Hezabr, 2018; Kolsi, 2017). This is in line with the theory of legitimacy that companies with high profits will disclose more voluntary disclosure, especially Carbon Emission Disclosure asa form of its responsibility in reducing its emissions.

H1: the higher the profitability the wider the disclosure of carbon emissions.

2.3.2. RelationshipbetweenIndustryType and CarbonEmissionDisclosure

Ilene (2016) divides the type of industry into 2 parts, namely high-profile and low-profile. Companies classified as high-profile or high-emitting are electricity, chemical, oil and mining, nuclear, iron production, automotive, paper, tobacco and cigarettes, health, food and beverage, transportation, and agribusiness industries. The low-profile classification includes household products, finance and banking, personal products and so on. The results of previous studies reveal that the type of industry has a significant relationship to carbon emissions' disclosures (Choi, Lee, & Psaros, 2013; Faisal, Adiningtyas, Achmad, & Haryanto, 2018; Chu, Chatterjee, & Brown, 2013; Ichsani&Suhardi, 2015; Hackston& Milne, 1996). This is because companies with environmental sensitivity and high-risk levels tend to be in the spotlight of the wider community. The government and the state will more closely monitor industries that produce high emissions. In maintaining their reputation and legitimacy, companies classified as high-profile will disclose their carbon emissions.

H2: Industry type classified as the high profile has a positive effect on carbon emissions' disclosures.

2.3.3. Relationshipbetween Company Size and CarbonEmissionDisclosure

Therelationshipbetweenfirmsize and carbonemissiondisclosure has positive results (Faisal, et al., 2018; Ghomi&Leung, 2013; Choi, Lee, &Psaros, 2013; Hermawan, et al., 2018; Chu,

171 Chatterjee, & Brown, 2013; Lorenzo, et al., 2009). Thisisbecausestakeholders,
172 especiallythecommunity, willpressurethembecausetheythinkthatthebiggerthecompany,
173 theincreased natural resourcesused. Thisis in line withJannah's (2014)
174 explanationthatlargercompanieswilldisclose more
175 voluntarydisclosureinformationthansmallercompanies. Thecompaniesthat are more
176 likelytohavetheresourcestopaythecostofdisclosinginformation (collecting and producing)
177 forusersoffinancialstatements. Therefore, thecompanywilldisclosecarbonemissions as
178 thedemandsofthestakeholders.
179
180 H3: Companiesclassified as bigfirmswilldisclose more
181 comprehensivecarbonemissionsthansmallcompanies
182
183 **2.3.4. LeverageRelationship and CarbonEmissionDisclosure**
184
185 Leverageisthecompany'sabilityto use debt in managingthecompanytomaximizerevenue.
186 Severalstudieshaverevealedthattherelationshipbetweenleverage and carbonemissions'
187 disclosuresisnegative (Al Russi, Selamat, &Hanefah, 2009; Kolsi, 2017).
188 Thisisbecausecompanieswithhighleverage are at a dangerpoint, so managers will reduce
189 expenses that are not in accordancewithbusinessactivitiessuch as
190 carbonemissionsdisclosures (Faisal, et al., 2018). Therefore,
191 environmentaldisclosureisdependentonequityfinancing and lowleverage.
192
193 H4: High leverage will reveal lower carbon emissions' disclosures
194
195 **3. RESEARCH METHOD**
196
197 The object of this research is manufacturing companies listed on the Indonesia Stock
198 Exchange from 2016 to 2018. In selecting the sample, the author uses the purposive
199 sampling method that has been discussed in the previous chapter.
200
201 **3.1 Variable Measurement**
202
203 **Independent Variable**
204 In thisstudy, researchersused 4 independent variables, namely: profitability, industrytype,
205 companysize, and leverage and thedependent variable wascarbonemissiondisclosure.
206 Disclosureofcarbonemissions can be seen in Table 2-3, and themeasurementofindependent
207 variables in Table 1.
208
209 **Table 1. Independent Variable Measurement**
210

No	Variable	Measurement
1	Profitability: theprofitthecompanygenerates. In this case using ROE (Kijewska, 2016)	$\dfrac{Net\ Income}{Shareholder\ Equity}$
2	Industrytype: basedonthecompanywiththelevelofcarbonemissionsproduced (Choi et. Al., 2013)	- *high-emitted* value 1 - *low-emitted* value 0.
3	Company sizeismeasuredbytheamountof total assets (Jannah, 2014)	Company Size = Total assets
4	Leverage: as proxiedby DER (Arifin, 2007)	$DER = \dfrac{Total\ Debt}{Total\ Equity}$

211

Dependent Variable

212
213
214 Choi, Lee, & Psaros (2013) categorized voluntary levels of disclosure related to climate
215 change and carbon emissions into 18 categories based on demand factors from the Carbon
216 Disclosure Project (CDP).
217
218   **Table 2. Carbon Emission**
219

1	Climate change, risk and opportunities	CC1 – description of the risks (regulatory, physical or general) relating to climate change and actions and taken or to be taken to manage the risks CC2 – description of current (and future) financial implication, business implications and 6pportunities of climate change
2	GHG emission accounting	GHG1 – description of the methodology used to calculate GHG emission (e.g. GHG protocol or ISO) GHG2 – existence external verification of quantity of GHG emission-if so by whom and on what basis GHG3 – total GHG emissions – metric tonnes CO_2 emitted GHG4 – disclosure of Scopes 1 and 2, or Scope 3 direct GHG emissions GHG5 – disclosure of GHG emissions by sources (e.g. coal, electricity, etc.) GHG6 – disclosure of GHG emissions by facility or segment level GHG7 – comparison og GHG emissions with previous years
3	Energy Consumption accounting	EC1 – total energy consumed (e.g. tera-joules or peta joules) EC2 – quantification of energy used from renewable sources EC3 – disclosure by type, facility or segment
4	GHG reduction and cost	RC1 – detail of plans or strategies to reduce GHG emissions RC2 – specification of GHG emissions reduction target level and target year RC3 – emissions reductions and associated costs or savings achieved to date as a result of the reduction plan RC4 – cost of future emissions factored into capital expenditure planning
5	Carbon Emission Accountability	ACC1 – indication of which board committee (or other executive body) has overall responsibility for actions related to climate change ACC2 – descritption of the mechanism by which the board (or other executive body) reviews the company's progress regarding climate change

220 Carbon Disclosure checklist (Choe et al., 2013)
221
222
223

4. RESULTS AND DISCUSSION

Theresultsofsampleselection can be seen in Table 3 below:

Table 3. SampleSelection

No.	Criteria	Amount
1	Manufacturing companies listed on the IDX for the 2016-2018 period	142
2	Manufacturing companies that did not report consecutive financial statements in 2016-2018	(18)
3	Companiesthatdidnotpublishconsecutiveannualreportsorsustainabilityreporti n 2016-2018	(11)
4	Doesnotdisclosepoliciesoritemsregardinggreenhouse gases	(77)
Thenumberofresearchsamples per year		**36**
Numberofobservationsfrom 2016-2018		**108 firm-years**

We choose 2016-2018 because of the sample criteria used by sustainability report with the GRI Standard. Therefore, the GRI standard released in 2016 and the last data we got was 2018.

Thedivisionofhighprofile industrial sectors (companieswithhighcarbonemissionrisk) and lowprofile (companieswithlowcarbonemissionrisk), dueto 63% ofcarbonpollution in the air isproducedbythecoal, petroleum and othermining industries.

Internationally, industry categorization is regulated by the Global Industry Classification Standard (GICS), Russell Global Sectors (RGS), and Industry Classification Benchmark (ICB). The industrial sector's GICS version is divided into energy, materials, industrials, consumer discretionary, consumer staples, health, finance, information technology, telecommunications networks, utilities, and real estate. Industrial sectors that are classified as carbon-intensive sectors, namely energy, land use, and agriculture, industry, transportation, residential, commercial, & institutional. Therefore, based on classification GICS as follows (See table 4).

Table 4. Classification of Companies According to High-low Emission

Emisiion Classification	Industry Sector
Low	*Consumer durables and apparel*
	Health Care
High	*Construction Materials*
	Building Products
	Metals and Mining

	Chemicals
	Paper and Forest Products
	Automobiles and Components
	Electrical Equipment
	Food, Beverages, and Tobacco

Source: processed secondary data, 2020

4.1 DescriptiveStatistics

Descriptivestatisticsforeachresearch variable are presented in table 5. Basedonthestatisticalresults, onlytheleverage variable has a standard deviationof more than 2. The data forotherresearch variables are relativelystable.

Table 5. DescriptiveStatistics

	N	Min	Max	Mean	Std Dev
X1	108	0.000	9.640	4.341	2.247
X2	108	0.000	1.000	0.778	0.417
X3	108	5.180	5.820	5.489	0.167
X4	108	0.000	12.440	5.275	4.130
Y	108	0.690	5.550	2.975	1.100

Source: Secondary data processed by SPSS
Notes: X1 is the company's profitability variable; X2 is a type of industry; X3 is the company's size and X4 is the leverage, while Y is the disclosure of carbon emissions.

Based on the descriptive statistic the sample shows large companies, this means that companies disclosing carbon reporting are mostly big companies. Leverage data tends to fluctuate for the sample firms.

4.2 Discussion

Theresultsofstatisticaltesting are shown in Table 6. Basedonthe test results show thatthe variable profitability, industrytype and companysizeplay a role in disclosingcarbonemissions. Ontheotherhand, leverageisnot a considerationfordisclosingcarbonemissions.

Table 6. ResultsofHypothesisTesting

Model	β	P value (Significance)
(Constant)	-8.695	**)-2.903 (.005)
Profitabilitas (X1)	.088	**)2. 073 (.041)
TipeIndustri (X2)	.939	***)4.194 (.000)
Ukuran Perusahaan (X3)	1.955	***)3.575 (.001)
Leverage (X4)	-.034	-1.515 (.133)
Notes: **Model: Y**$= \alpha + \beta 1\, X_1 + \beta 2 X_2 + \beta 3\, X_3 + \beta 14 X_4 + e$ ***; ** and * indicates significant at 1%, 5% and 10% level of significance based on t-statistics. R^2 32.9%		

F test: 12.643 (0.000)

Companieswithgoodfinancial performance (highprofitability) tendtoget more attentionfromseveralstakeholders, such as investors, thepublic, thegovernment and the media. Thisresults in thecompanyhavinggreaterpressure, notonlyhaving a goodfinancial performance in investors' eyes, butfromanoperational and environmentalperspective, thecompanyneedsattention. Thisfindingisconsistentwiththefindingsofmanyresearchers (Faisal et al., 2018; and Hermawan et al., 2018)

In line withthelegitimacytheorythatcompaniesneed social existence in society, companieswithhighprofitabilityhavetheopportunitytoreveal more aboutthecompany'scarbonemissions. Thisstudy'sresults are inconsistentwiththefindingsof Chu et al (2013), whoresearched in China. Moreover, thereis no standard in disclosingcompanycarbonemissions.

Companieswith a highlevelofenvironmentalsensitivity (highemission) havetightersupervisionbythegovernment and society. Theresultsofthisstudysupporttheseearguments and are consistentwiththefindingsof Chu et al. (2012) and Choi et al. (2013). Basedonthelegitimacytheory, companieswill try tofulfiltheircorporateresponsibilitiestobelievethatthecompany has goodquality. Thisisthebasisforcompaniesattemptingtocarryoutenvironmentalresponsibility, especiallyregardingcarbonemissions. Climatechange has resulted in thecommunitybeing more sensitivetoenvironmentalissues so thatthecompany shows itsexistence in protectingtheenvironment. Apartfromthesereasons, disclosureofcarbonemissionsisalsopartofIndonesia'sachievement target in participating in reducing global warming, particularlyforhighemissioncompanies.

Thisresearchsupportsthatsizewillreveal a widerrangeofcarbonemissions. Largecompanieswilldisclose more concerningcarbonemissionsthansmallcompanies (Freedman &Jaggi, 2005). Basedonthetheoryoflegitimacy, thecompanyisexpectedtofulfilthesurroundingcommunity'swishestomaintainitsexistenceboth in the short and longterm. Thismakesthelargerthecompany, the more carbonemissionswill be revealed (Ghomi&Leung, 2013; Ismail et al., 2018; Choi et al .; 2013, Gonzalez&Ramirez, 2016 and Lorenzo et al., 2009).Companiesthatreportcarbonreporting can increasefirmvalue, theregulatorshouldrequirethisreport (Matsumura et al., 2014).

This study does not suport the latter hypothesis, related to leverage, meaning that disclosure of carbon emissions is not caused by high or low leverage. Based on the signal theory, companies with leverage will show better financial performance, because they are responsible for creditors by reducing costs outside of production. Disclosure of carbon emissions is more influenced by investors than creditors.

Tang & Luo (2011) explained that companies have a high level of leverage that disclose broadly. Still, some do not disclose widely, so the level of leverage does not significantly affect Carbon Emission Disclosure. This is because leveraged companies tend to prioritize financial performance. Simultaneously, the extent of disclosure of carbon emissions is considered an optional addition, except for Annex I countries that require disclosure.

5. CONCLUSION

This study aims to determine the factors that cause manufacturing companies to disclose carbon emissions voluntarily. Testing uses linear regression with a sample of 108 firm-years

326 for the 2016-2018 period. The results showed that the size of the profitability, the company's
327 size, and the type of industry could increase the extent of disclosure of carbon emissions.
328 This is in accordance with the theory of legitimacy, that the companies with more profits, the
329 size of companies and companies with higher carbon emission emitters, will get more
330 pressure from stakeholders (society, consumers and government).
331
332 On the other hand, this study cannot support the leverage factor, and this is because
333 companies with a high degree of leverage tend to improve their profit performance more and
334 avoid unnecessary costs, for example making reports on carbon emissions.
335
336 The results of this study reinforce the legitimacy theory, that companies are trying to meet
337 the demands of society with bigger companies, higher profits and industry types. For
338 regulators, the results of this study can be considered as input for making rules about carbon
339 emission reports.
340
341 This study has limitations in terms of the carbon emission checklist. There may be a
342 researcher's subjectivity factor. Future studies can use more than one research staff to
343 reduce subjectivity. Further research can use samples in the banking industry, because
344 sustainability reports become mandatory in 2019. It is likely to give different results, even
345 though the banking industry is included in scope 2 and 3 in relation to carbon emissions.
346

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