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Factors Influencing Carbon Management Accounting Adoption in Indonesia

Tommy Andrian[1], Etty Murwaningsari[2*], Yvonne Augustine Sudibyo[2]

[1] Doctoral Program in Accounting, Faculty of Economics and Business, Universitas Trisakti, Jakarta 11440, Indonesia
[2] Accounting Department, Faculty of Economics and Business, Universitas Trisakti, Jakarta 11440, Indonesia

Corresponding Author Email: etty.murwaningsari@trisakti.ac.id

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ABSTRACT

This study aims to analyze the effects of green strategy, green social capital, and environmental consciousness on carbon management accounting adoption with green culture as a moderating variable. The study uses a quantitative approach by distributing questionnaires to 340 respondents in middle-up management positions in listed and non-listed companies on the Indonesian Stock Exchange. Multiple linear regression analysis was used with the Smart PLS & SPSS statistical tool. This research shows that green strategy has a significant positive effect and green social capital has a significant positive effect on carbon management accounting adoption. Meanwhile, environmental consciousness has no significant effect and green culture cannot moderate the relationship between green strategy, green social capital, and environmental consciousness on carbon management accounting adoption. The contribution of this research provides four new dimensions and 17 new indicators in measuring the adoption of carbon management accounting according to the Indonesian context. Also, this proves that carbon management accounting adoption needs to be supported by the implementation of a green strategy and the development of human resources who are always willing to share knowledge related to climate change issues as evidence to stakeholders of the efforts of corporations to support reducing greenhouse gas emissions.

1. INTRODUCTION

The world is facing a health emergency and economic crisis due to the coronavirus disease (COVID-19) pandemic. However, the world must also pay attention to the negative impacts of climate change. The condition of COVID-19 may occur as a result of the highly damaging effects of climate change [1]. Whether this phenomenon is true or not, extreme weather must concern all humans if they want to save the earth. On the other hand, the COVID-19 pandemic has had a positive impact on reducing global carbon dioxide emissions by 17 percent compared to emission levels in 2019 [2]. However, of course, this emission reduction is temporary and will not last long, primarily since the impact is caused by a pandemic whose negative impact is terrible. Actions that must be taken are sustainable emission reductions so that the impact is indeed positive, following the Paris Agreement's global goals. Under this agreement, warming to 1.5℃ above pre-industrial levels needs to be reduced by 29% by 2030 if Indonesia makes its efforts or 40% if there is cooperation and assistance from other countries. This ambitious target is for the government and the business world.

The issue of carbon emissions has become so widespread that accountants and auditors expect carbon reduction initiatives and corporate emission reporting to play an important role has developed rapidly [3]. In climate change policy, management accountants are expected to position themselves as managers focusing on carbon control and implementing climate change strategies Lovell and MacKenzie [4]. This is achieved by incorporating assets, liabilities, and risks related to managing Green House Gas (GHG) emissions into conventional management accounting practices, governance, and control mechanisms [5-7]. Thus, Indonesia's efforts need to be significantly increased, especially in terms of awareness of environmental preservation. Various efforts to mitigate carbon emissions have been made at the country and company levels. At the country level, mitigation efforts are carried out through regulations related to carbon emissions, such as the EU-UTS European Union Emissions Trading Scheme, including Indonesia, and with a commitment to ratify the Kyoto Protocol and the Paris Agreement. Not only that, the 26th Conference of the Parties (COP26) was held, which aims to reduce the worst impacts of climate change, including emissions to net zero, and set the global agenda on climate change for the next decade.

Then, the Ministry of Energy and Mineral Resources [8] stated that Indonesia is committed to reducing emissions and achieving Net Zero Emissions in 2060. One of them is implementing a Carbon Tax, which will take effect from April 1, 2022, for the sector of Coal power plants with a cap and tax scheme in which companies pay taxes if their carbon emissions exceed the limits set by the government. One of the goals of a carbon tax is to stimulate industrial innovation and the transition to low-emission technologies.

More scientific evidence shows that carbon emissions, which are the leading cause of global warming, are a severe threat to life both economically, socially, and environmentally [9-13]. Disclosure of carbon emissions needs to be conveyed to stakeholders as evidence of efforts by corporations to

support the reduction of greenhouse gas (GHG) emissions. Most of the disclosure of GHG emissions has not become an obligation, so the disclosure is still voluntary [3]. However, since the issuance of POJK 51/POJK.03/2017, in Indonesia and other countries, this emission disclosure has become mandatory even though it does not explicitly refer to 'GHG emissions' but to energy efficiency and emission reduction. Based on climate change which can impact business and economic problems World Economic Forum [14], many researchers have previously examined the disclosure of carbon emissions. However, most of them use the Carbon Disclosure Project questionnaire guide to measure whether a company discloses [15-18]. The measurement of GHG emissions is highly developed, and demands from stakeholders are higher [19-21].

One of these measurements is Sustainability Accounting Standards Boardwhich states that entities must disclose metrics and targets used to assess and manage climate-related risks and opportunities that are relevant and material [22]. SASB also provides complete accounting metrics according to the needs of investors and following the industry. On the other hand, currently, many companies are required to disclose their GHG emissions following sustainable finance provisions to obtain financing from investors but not too many apply disclosures based on SASB [23]. Even so, disclosure of GHG emissions is vital for company sustainability. Then, Bappenas [24] explained that with Presidential Regulation No. 61/2011, it is essential to calculate the reduction of carbon emissions. In addition, the Financial Services Authority [25] has compiled a Phase II Sustainable Finance Roadmap to accelerate the implementation of environmental, social, and governance aspects by integrating seven components, including policies, products, market infrastructure, institutional coordination, non-government, human resources, and awareness. Then, Bappenas [24] provides technical guidance that outlines the scientific basis for calculating greenhouse gas emissions in a business as usual (BAU) scenario to increase the understanding of various parties at the national, provincial, and district levels to develop a national action plan for reducing greenhouse gas emissions. (RAN-GRK). All of these efforts show how significant changes must be made by all industries from a 'business as usual' model to a low carbon economy by achieving net zero emissions. However, research related to the adoption of carbon management is still relatively small [26, 27].

Therefore, in this study, we want to use an approach related to adopting carbon management accounting with some modifications to the measurements in the Indonesian context obtained from researches conducted by Lee [28] and Nartey [29]. In research, Nartey [29] defines adopting Carbon Management Accounting (CMA) as measuring the level of carbon emission activity, data collection, and communication in response to climate change within and between companies. The importance of adopting carbon management accounting to reduce greenhouse gas emissions is the motivation for conducting this research and obtaining empirical evidence on the factors influencing the adoption of carbon management accounting.

First, strategy is defined as an effort to achieve the vision and mission set by company management [30]. Green strategy activities not only save the earth from climate change due to an increase in the earth's temperature caused by the greenhouse effect but can also increase business efficiency. In contrast to Li et al. [31], grouping by the number of green patents shows a negative effect between environmental legitimacy and corporate carbon disclosure. This is because the green strategy (GRS) only provides a competitive advantage and does not affect the reduction of carbon emissions.

Second, Green Social Capital (GSC) will be vital in achieving carbon management accounting. This is because green social capital relates to knowledge obtained from informal and personal relationships of employees about environmental commitment and collaboration. Researches by Chang and Chen [32] and Verde et al. [33] state that green social capital positively influences carbon management accounting. The results of the studies by Chang and Chen [32] and Verde et al. [33] are different from the analysis by Palomino and Tadeo [34], which states that there is no influence between green social capital on environmental performance. This absence of influence is because green social capital is a set of intangible objects that compose and develop effective and efficient corporate environmental management so that it does not significantly impact carbon management accounting.

Third, the advantages of companies with high Environmental Consciousness (ENC) include getting incentives from the Government and having a competitive advantage in the market. Companies that are aware of the environment can facilitate the implementation of carbon management accounting [35]. Based on previous researches by Englis and Phillips [36], Mishal et al. [37], and Rustam et al. [38], there is an ENC within the company that has a positive effect on carbon management accounting. In contrast to the research by Sasaoka [39] and Lin [40], ENC has a negative effect on carbon management accounting. The reason is that people in developing countries are more likely to worry about environmental damage and show more commitment to the environmental movement. However, they are more reluctant to disclose environmental-related activities, including adopting carbon management accounting, because they consider governments and organizations more responsible for environmental damage.

Fourth, several previous studies have used factors expected to influence carbon management accounting. Research conducted by Eleftheriadis and Anagnostopoulou [41] uses carbon reduction targets and risk management integration; analysis by Nartey [29] uses organizational strategy, structure, and size; and research by Renukappa et al. [42] uses CSR and environmental committees. From all these studies, not many studies have used green cultural variables to strengthen the relationship of each of these variables to the adoption of carbon management accounting. A green culture has an important role in creating sustainable development, and one of its goals is related to efforts to achieve net zero emissions.

Several other factors influence the dependent variable of carbon management accounting adoption. If these factors are not adequately controlled, they will affect the accuracy of the research results on the dependent variable [43]. Based on understanding the importance of having variables that can control the relationship between the independent and dependent variables, this study uses control variables, namely technology and green initiatives. Technology variables are used based on the importance of adopting innovation for all companies to maintain sustainability, especially during the COVID-19 pandemic [44]. Nartey [29] also states that information technology can link one activity to another and shows the importance of managing carbon emissions, which ultimately influences the adoption of carbon management

accounting. Thus, the technology variable will be used as a control variable to strengthen this research model. Second, this study uses green initiative variables to control independent variables to dependent variables. Research conducted by Kushwaha and Sharma [45], Koo et al. [46], and Van den Broek and Van den Broek-Serlé [47] state that if companies only think about their business for profit alone without thinking about initiatives that come from going green, or waiting for the hype about green and sustainability, then the business loses the opportunity to chart a better direction for the company.

Given that empirical findings remain inconclusive, further research is needed to understand how green strategy, social capital, and environmental consciousness can affect the adoption of carbon management accounting. In addition, this paper wants to know if the green culture variable can moderate the GRS, GSC, and ENV and carbon management accounting adoption. The rest of the study is organized as follows. Section 2 provides a literature review and offers our hypothesis. Section 3 introduces the research methodology. Section 4 lists the results and discussion of the empirical analysis. Section 5 summarizes the paper.

2. LITERATURE REVIEW

2.1 Institutional legitimacy theory

From the legitimacy theory perspective, it explains that there is a concept of a social contract between the company and the community, in which the community has implicit and explicit expectations for the company regarding its operations. Meanwhile, institutional theory shows that companies will adopt structures, procedures, and policies from other companies to establish suitability, credibility, and legitimacy to stakeholders. Thus, from a societal perspective, institutional legitimacy theory is used to investigate institutional structures and activities that have gained social acceptance. These structures, activities, and procedures are used as a baseline to evaluate whether the organization has gained legitimacy [48]. In line with the theory of institutional legitimacy, companies will imitate one another regarding environmental disclosure [49]. Companies will observe other companies that have adopted a comprehensive environmental disclosure strategy and then replicate it as the practice is widely accepted. One of the disclosures that are a form of normative institution is the disclosure of carbon emissions. Companies disclosing carbon emissions due to significant pressure from industry, such as non-governmental organizations or the mass media, regarding carbon disclosures by companies will further encourage companies to adopt carbon management accounting as a means of corporate reporting.

2.2 Hypotheses development

2.2.1 Hypotheses development

In the theory of institutional legitimacy, the community wants to ensure the activities or responsibilities that have been carried out by companies which in this context are related to the issue of carbon emissions; the company must develop a strategy so that it can support the goals of reducing carbon emissions produced by the company [50]. Efforts are being made to minimize the resulting carbon emissions starting with the vision of a green strategy company, and green strategy is needed to integrate risks and opportunities in corporate strategy that impact climate change so that this will encourage the adoption of carbon management accounting [51]. Therefore, companies need to create a strategy to make the company more sustainable by focusing not only on the wealth side but also the environmental side of the company itself, which will impact its stakeholders. Companies that disclose information about carbon emissions compulsorily or voluntarily can discover the risks and opportunities in dealing with climate change. Companies can integrate risks and opportunities in corporate strategies that impact the environment. Disclosure of information in question is the company's ability to manage emissions as a form of effort to manage risks and opportunities due to climate change. Risks and opportunities can be integrated into the form of corporate strategy, which is a green strategy. Makower [52] stated that companies that take advantage of opportunities from the effects of climate change by taking advantage of competitive advantages through green strategies would demonstrate the company's ability to manage carbon emissions through carbon management accounting adoption. Based on this basis, the hypothesis can be formulated as follows:

H1: Green strategy has a positive influence on carbon management accounting adoption

2.2.2 Green social capital and carbon management accounting adoption

In the theory of institutional legitimacy, the public evaluates company activities to reduce carbon emissions so that companies will imitate other companies in terms of environmental disclosure of carbon emissions [49]. To replicate other companies' efforts to reduce carbon emissions, they must have the green social capital to exchange ideas and share knowledge among employees who show commitment from employees to reducing the impact of climate change [3]. Therefore, it will make companies increasingly aware of the importance of recording carbon emissions by adopting carbon management accounting. Green social capital is one component of green intellectual capital; it includes informal contact, constructive discussion, knowledge sharing among employees, and mutual collaboration on environmental projects. So, companies need to pay attention to internal factors to build good relationships within the company in developing environmental activities, especially in terms of carbon management. Employee relations facilitate the innovation process due to more incredible speed of knowledge flow and better utilization. Social capital used through exchanging ideas and knowledge sharing among employees shows a positive relationship with product innovation. All these shared ideas demonstrate employees' commitment and guide the improvement of the company's environment, which can achieve its environmental goals without excessive managerial intervention [53]. Strong integration between them and their social relations can help develop solutions for preventing and identifying pollution sources that impact climate change, one of which is the problem of carbon emissions, and will further encourage companies to adopt carbon management accounting. Based on this basis, the hypothesis can be formulated as follows:

H2: Green social capital has a positive influence on carbon management accounting adoption

2.2.3 Environmental consciousness and carbon management accounting adoption

Institutional legitimacy theory shows that to gain legitimacy from stakeholders, companies will adopt structures, procedures, and policies from other companies to establish suitability, credibility, and legitimacy to stakeholders. This is because the company tries to meet external expectations of corporate responsibility related to environmental awareness and sustainable development. Institutional legitimacy theory focuses on information disclosure as a tool to overcome institutional pressure to make companies more aware of paying attention to business ethics and social and environmental responsibility by conducting carbon inventories and encouraging companies to adopt carbon management accounting to gain stakeholder legitimacy interests for sustainable corporate survival. Environmental awareness as an element of a belief system refers to certain psychological factors associated with a tendency to engage in pro-environmental behavior [53]. Companies that produce high levels of greenhouse gas emissions tend to have more significant incentives to carry out CSR activities to eliminate pressure from all stakeholders. Thus, it will encourage these companies to adopt carbon management accounting because they have environmental awareness accompanied by pressure from stakeholders. This aligns with researches by Rustam et al. [38] and Choi et al. [15] that stakeholders will see how company awareness responds to public awareness of the importance of protecting the surrounding environment, including carbon emissions. Based on this basis, the hypothesis can be formulated as follows:

H3: Environmental consciousness has a positive influence on carbon management accounting adoption

2.2.4 Green culture, green strategy, and carbon management accounting adoption

The theory of institutional legitimacy applied to a culture of sustainability has an essential role in creating sustainable development Jamali [54]. One of its goals is to achieve net zero emissions in business processes that are more eco-friendly to gain legitimacy from stakeholders. Increasing green strategies will give companies a competitive advantage and a corporate image as "good citizens" in front of stakeholders. Companies will increasingly realize the importance of calculating carbon emission reductions and encourage the adoption of carbon management accounting. A green culture has environmentally related values that companies have internalized throughout the organization and are usually modified in mission statements for all employees and managers. Thus, a green culture can better direct employees to strengthen green strategy in terms of formulating and pursuing a green strategy, management involvement in green strategy, changes in the firm's business model, organizing and managing a green strategy. This will encourage better adoption of carbon management accounting. Based on this basis, the hypothesis can be formulated as follows:

H4: Green culture strengthens the link between green strategy and carbon management accounting adoption

2.2.5 Green culture, green social capital, and carbon management accounting adoption

According to Sudibyo [55], institutional legitimacy theory states that organizations are instruments for capital and wealth formation, which utilize social capital with environmentally oriented ideas and commitments to promote economic, social, and environmental goals. Suppose a green culture supports this. In that case, it will encourage companies to adopt carbon management accounting to gain legitimacy from stakeholders and maintain business continuity. Then, social capital used through exchanging ideas and knowledge sharing among employees shows a link with product innovation. All these shared ideas demonstrate the environmental commitment of employees and guide environmental improvements for companies that can achieve their environmental goals without excessive managerial intervention [56]. Suppose this is reinforced by the green culture that exists in the company to support environmental values. In that case, it encourages employees to reduce waste proactively, consume fewer resources, and develop recycling programs, so that it will implement carbon management accounting adoption effectively. Based on this basis, the hypothesis can be formulated as follows:

H5: Green culture strengthens the link between green social capital and carbon management accounting adoption

2.2.6 Green culture, environmental consciousness, and carbon management accounting adoption

Based on the theory of institutional legitimacy, disclosure of information related to carbon emissions is a form of normative institution. Companies disclose carbon emissions because they want to gain legitimacy from stakeholders, which will further encourage companies to adopt carbon management accounting as a means of corporate reporting. Companies will imitate other companies that have paid attention to their green aspects to enhance their reputation or corporate image that is responsive, adaptive, and responsible for sustainable development. Environmental consciousness refers to certain psychological factors related to human tendencies to behave pro-environmentally [55]. Therefore, this study uses a green culture to strengthen environmental consciousness, which can direct employees to accept innovation and increase awareness of green as a fundamental value of the organization and feel more involved in environmental issues, which can encourage the adoption of carbon management accounting [57]. Based on this basis, the hypothesis can be formulated as follows:

H6: Green culture strengthens the link between environmental consciousness and carbon management accounting adoption

2.3 Conceptual framework

This study uses green strategies, green social capital, and environmental consciousness as independent variables and green culture as moderating variables, as well as technological control variables and green initiatives. This study uses the green culture factor as a moderating factor because it considers the values internalized by companies throughout the organization and which are usually modified in mission statements for all employees and managers. Thus, a green culture can direct employees to accept green strategies, green social capital, and environmental consciousness as the organization's fundamental values and feel more involved in environmental issues to encourage the adoption of carbon management accounting (Figure 1).

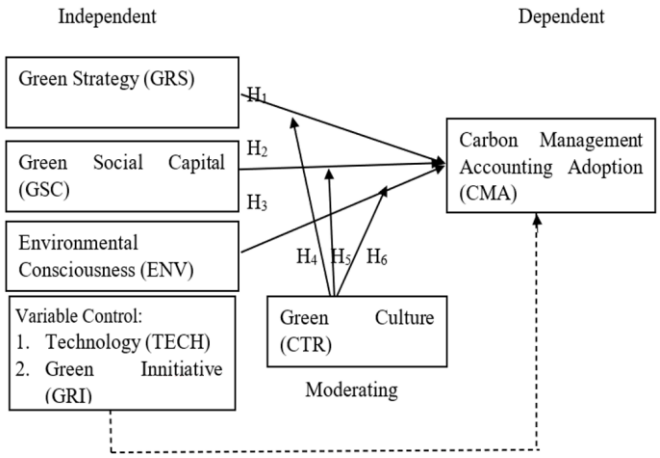

Figure 1. Conceptual framework

3. RESEARCH METHODOLOGY

This study applied a quantitative approach using primary data by distributing questionnaires online to 900 respondents. In this study, a total of 403 respondents had been collected who had filled out the questionnaire. Ten respondents were reduced from the sample because the respondents did not meet the criteria for a limited liability company. Then, the sample was reduced by 27 respondents because they did not meet the qualifications for a minimum supervisory position, and outlier data reduced the sample by 26 respondents. Thus, a total of 340 respondents were collected to be used in this study. The questionnaire was distributed using a Google form to each respondent via email and sending direct messages on WhatsApp. Sampling in this study uses nonprobability sampling with a convenience sampling technique. The criteria for the respondents who were sampled were individuals at the organizational level using a minimum level of supervisors, managers, to directors at listed and non-listed companies on the Indonesia Stock Exchange (IDX), and the respondent's education was at least a bachelor's degree. Data analysis in this study used multiple regression analysis, which was obtained using statistical tools such as SmartPLS (Partial Least Square) and SPSS. The questionnaire in this study used a Likert scale of 1 to 6 to examine the respondent's perceptions and determine how strongly they agreed or disagreed with the statements.

The measurement of the dependent variable in this study, namely carbon management accounting, refers to the research conducted by Lee [28] and Nartey [29] with 13 indicators. Still, these two studies have not adjusted for the rapidly growing phenomenon of sustainability and are not yet following the Indonesian context; this research adds four new dimensions adopted from Hansen and Mowen [58] related to environmental costs, namely prevention costs, appraisal costs, internal failure costs, and external failure costs. This dimension was added because the research by Lee [28] and Nartey [29] did not classify environmental costs precisely to determine the quality of a product or service produced following market expectations, one of which is a product or service to reduce the impact of climate change. Also, this study adds 17 new indicators that refer to research by Haldorai et al. [59], Kau and Nel [60], and Sustainability Accounting Standards Board [22], so a total of 30 indicators. An additional 17 indicators and four new dimensions were tested in a pilot study through interviews with two sources who are experts in the field of sustainability to ensure that these additional indicators are appropriate to the Indonesian context.

The pilot study procedure was carried out using interviews with the two experts simultaneously by confirming each indicator used so that input was given regarding developing appropriate indicators according to local Indonesian content, which is more straightforward for understanding respondents. Then, the independent variable, namely the green strategy variable, refers to research by Moini et al. [61] with 18 indicators. The green social capital variable relates to research by Verde et al. [33] with four indicators. The environmental consciousness variable refers to the study of Huang and Kung [56] and Sudibyo [55] with nine indicators. This research also uses a control variable, namely technology, which refers to the study by Nartey [29] with five indicators, and green initiative variables, which refer to research by Kushwaha and Sharma [45] with a total of 2 indicators.

All indicators of this questionnaire will be tested with validity and reliability tests to determine how much a measuring instrument can be trusted in measuring something. Also, descriptive statistical tests are carried out, which can provide an overview or description of data seen from the average value (mean), standard deviation (level of deviation), maximum, and minimum. This test will be discussed in more detail in Section 4.

4. RESULT

4.1 Validity and reliability test

The measurement model, the convergent validity, and the discriminant validity were evaluated in this study. Table 1 shows that the validity test assesses the validity of the question items by looking at the average variance extracted (AVE) value. The test results for all CMA, GRS, GSC, ENV, CTR TECH, and GRI variables have an AVE value greater than 0.5 (> 0.5) which indicates that all variables in this study are declared valid by convergent validity so that it can be concluded that all variables used in this study meet the requirements [62]. Then, for reliability testing, the study used composite reliability values. The test results showed that all measuring instruments in the study exceeded the expected Cronbach's alpha value > 0.70. These results state that the questionnaire given to the respondents will provide consistent, reliable, and relevant results to the variables.

Dependent Variable: Carbon Management Accounting (CMA), Independent Variable: Green Strategy (GRS), Green Social Capital (GSC), Environmental Consciousness (ENV), Moderating Variable: Green Culture (CTR), Variable Control: Technology (TECH) and Green Initiative (GRI).

Table 1. Validity and reliability result

Variables	AVE	Decision	Cronbach's Alpha	Decision
CMA	0.547	Valid	0.971	Reliable
GRS	0.598	Valid	0.959	Reliable
GSC	0.876	Valid	0.953	Reliable
ENV	0.781	Valid	0.965	Reliable
CTR	0.832	Valid	0.960	Reliable
TECH	0.794	Valid	0.935	Reliable
GRI	0.841	Valid	0.811	Reliable

Source: Data processed using SmartPLS

4.2 Descriptive statistics

Table 2 explains the results of the descriptive statistics for the CMA variable, which has the highest score, namely a score of 6, which means that it strongly agrees that the minimum value is 3.13, which means that it quite disagrees. This is because currently not all companies in Indonesia have agreed to make detailed disclosure of greenhouse gases accompanied by carbon calculation metrics to stakeholders, have not agreed to participate in trading carbon emissions and carry out social responsibility activities related to carbon emissions because, indeed at this time it still follows existing regulations and has not yet reached the philanthropic (voluntary) stage. The mean value of the CMA variable is 5.01, which means that it agrees with all indicators. This shows that the average respondent's answers agree to commit to protecting the environment, especially against the impact of carbon emissions. The standard deviation value of the CMA variable is 0.32, which is smaller than the mean value, so the CMA variable has a low deviation rate.

Dependent Variable: Carbon Management Accounting (CMA); Independent Variable: Green Strategy (GRS), Green Social Capital (GSC), Environmental Consciousness (ENV), Moderating Variable: Green Culture (CTR), Variable Control: Technology (TECH) and Green Initiative (GRI).

Table 2. Descriptive statistics result

Variables	N	Min	Max	Mean	Std Dev
CMA	340	3.13	6.00	5.01	0.32
GRS	340	3.17	6.00	5.05	0.31
GSC	340	3.00	6.00	5.11	0.42
ENV	340	3.33	6.00	5.15	0.39
CTR	340	3.00	6.00	5.13	0.42
TECH	340	3.60	6.00	5.42	0.48
GRI	340	3.00	6.00	5.20	0.51

Source: Data Processed Using SPSS

Then, the GRS variable has a minimum value of 3.17, meaning the answer quite disagrees. This is because the company and its employees disagree if it is resistant to being green and instead supports changes towards being green to create a low-carbon business environment. The GRS variable's maximum weight is 6.00, which means it strongly agrees. The mean value of the GRS variable is 5.05, which means that the average respondent answering the questions in this study agrees. This is because management realizes the importance of green issues and tries to overcome these problems through the strategies set by management. Then, the standard deviation value of the GRS variable is 0.31, which is smaller than the mean value, so the GRS variable has a low deviation rate.

Then, the GSC variable has a minimum value of 3.00, reflecting the answers that quite disagree. This is due to quite disagreeing. Many employees do not know with certainty the detailed information regarding negative environmental impacts, including carbon emissions, so it is impossible to share knowledge and generate new ideas. Then, the GSC variable's maximum value is 6.00, which describes the strongly agree responses. This is because several companies have acquired sufficient knowledge regarding negative environmental impacts obtained through non-formal activities such as seminars and formal such as participating in competency certification, allowing them to share and generate new ideas to overcome negative environmental impacts. The mean value of the GSC variable is 5.11, which means that the average respondent answering the questions in this study agrees, and the standard deviation value of the GSC variable is 0.42, which is smaller than the mean value, so the GSC variable has a low deviation rate.

Also, the ENV variable has a minimum value of 3.33, reflecting the answers that quite disagree. This is because companies are increasingly aware of ethical, social, and environmental responsibilities, and this can be seen from several efforts made, such as reducing paper use, conducting vehicle fuel emission testing, and reducing electricity use, of course, this shows a high environmental awareness by the company voluntarily. Then, the maximum value of the ENV variable is 6.00, which describes the strongly agreed answers. The mean value of the ENV variable is 5.15, which means that the average respondent answering the questions in this study agrees. This is because the company is aware that social and environmental responsibility is a positive image that can be obtained by the company based on the assessment of stakeholders so that it can impact the company's long-term profits. The standard deviation value of the ENV variable is 0.39, which is smaller than the mean value. Hence, the ENV variable has a low deviation rate.

Then, the CTR variable has a minimum value of 3.00 which means the answer quite disagrees. This is because the company's green culture is not fully related to being green. Then, the CTR variable's maximum weight is 6.00, which means it strongly agrees. The mean value of the CTR variable is 5.13, which means that the average respondent answering the questions in this study agrees. This is because the company has made efforts such as involving employees in attending seminars and certification to understand the environment. The standard deviation value of the CTR variable is 0.42, which is smaller than the mean value, so the CTR variable has a low deviation rate.

Afterward, the TECH variable has a minimum value of 3.60, meaning the answer quite disagrees. This is because there are still companies that do not entirely rely on electronic mail for communication because there are companies that have specific applications that are used internally in exchanging information. Then, the TECH variable's maximum weight is 6.00, which means it strongly agrees. The mean value of the TECH variable is 5.42, which means that the average respondent answering the questions in this study agrees. This is because, for now, most companies use electronic mail as electronic media, which can help reduce emission levels compared to communication that still relies on transportation. The standard deviation value of the TECH variable is 0.48, which is smaller than the mean value, so the TECH variable has a low deviation rate.

After that, the GRI variable has a minimum value of 3.00 which means the answer quite disagrees. This is because some still do not understand the concept and have not applied the idea of mitigating the negative impacts of climate change. Then, the GRI variable's maximum weight is 6.00, which means it strongly agrees. The mean value of the GRI variable is 5.20, which means that the average respondent answering the questions in this study agrees. This is because most companies are currently limited in understanding the concept, and not many have reached the implementation stage because there are no binding rules. The standard deviation value of the GRI variable is 0.51, which is smaller than the mean value, so the GRI variable has a low deviation rate.

Table 3. Sensitivity analysis result

		Model 1 (Non-Novelty)		Model 2 (Novelty)	
	Prediction	**Coefficient**	**p-values**	**Coefficient**	**p-values**
GRS -> CMA	+	0.525	0.000*	0.533	0.000*
GSC -> CMA	+	0.193	0.005*	0.224	0.003*
ENV -> CMA	+	0.015	0.799	0.006	0.909
GRSxCTR -> CMA	+	0.003	0.968	0.025	0.656
GSCxCTR -> CMA	+	0.021	0.818	0.005	0.951
ENVxCTR -> CMA	+	-0.126	0.007	-0.121	0.006
TECH -> CMA		0.035	0.333	0.033	0.342
GRI -> CMA		0.044	0.238	0.027	0.469
Adjusted R-Square		0.556		0.567	

Source: Data processed using SmartPLS
Notes: *p < 0.05

4.3 Sensitivity analysis

Table 3, model 1 is a regression test carried out without using new dimensions and indicators. The processing results show that the independent variables of green strategy and green social capital significantly positively affect adopting carbon management accounting. In contrast, other variables have no significant effect, and the moderation variable of green culture can only interact with the independent variables and their dependents. Then, the adjusted R-Square value of 0.556 or 55.6% indicates the ability of the independent variables used in this study to explain the dependent variable and the remaining 44.4% is explained by other variables not included in this study. Then, the results of model 2 testing are regression model tests that are carried out using new dimensions and indicators. The processing results show that the independent variables of green strategies and green social capital significantly positively affect adopting carbon management accounting. In contrast, the other variables have no significant effect, and the moderation variable of green culture can only interact with the independent variables with their dependents. However, there is a slight difference with model 1, which is without novelty where the adjusted R-Square value is larger by 0.011, namely 0.567 or 56.7%, which indicates the ability of the independent variables used in this study to explain the dependent variable and the remaining 43.3% is explained by other variables not included in this study.

Dependent Variable: Carbon Management Accounting (CMA); Independent Variable: Green Strategy (GRS), Green Social Capital (GSC), Environmental Consciousness (ENV), Moderating Variable: Green Culture (CTR), Variable Control: Technology (TECH) and Green Initiative (GRI).

4.4 Discussion

Discussion of the results of this study uses model 2 with the presence of novelty and is explained in the discussion as follows:

The company already has a green strategy to address climate change, has implemented a green strategy to address climate change, and discussions have been held between middle management to top management regarding issues related to the impact of climate change. One of them is the issue of carbon emissions. Several efforts have also been made for green strategies, such as reducing paper use and routinely testing vehicle emissions according to specified thresholds. However, these efforts require time for adjustments and adaptation towards a low carbon economy, which can affect the adoption of carbon management accounting. Then, informal communication has been established between employees related to the environment to reduce the impact of climate change, employees are willing to share knowledge, experiences, and ideas regarding the environment that they know to reduce the effects of climate change. This can be done by conveying it directly to top management and holding regular meetings to discuss climate change issues, including carbon emissions. These efforts can further encourage the adoption of corporate carbon management accounting.

However, even though middle and top management is aware of ethical, social, and environmental responsibilities and has agreed that social, environmental, and profitability responsibilities can be compatible with each other, their implementation is still not optimal even though they already have awareness. Environmental issues, especially concerning carbon emissions, still refer to regulations. Currently, these regulations are still not specific for measurements and metrics related to carbon accounting, so this cannot influence the adoption of carbon management accounting. Then, the company has had a joint effort to make every employee understand the importance of environmental preservation, a statement regarding clear policies that encourage environmental awareness in every area, but a green culture has not been able to moderate a green strategy towards the adoption of carbon management accounting because a green culture within the company is fully implemented by the company and is still considered not a priority in the company's business, which causes the environmental behavior and knowledge of the members of the organization not to be embedded appropriately and has an impact on the implementation of the green strategy that has been prepared previously.

In addition, the company has a joint effort to make every employee understand the importance of environmental preservation, a statement regarding clear policies that encourage environmental awareness in each area but does not moderate informal communication between employees for constructive discussions among employees to solve problems. Related to the environment in companies to reduce the impact of climate change because to form green human resources require adequate socialization and training. Not all companies allocate this and are limited to voluntarily providing information. Therefore, a green culture cannot moderate green social capital by adopting carbon management accounting. In cultivating management awareness for a green culture, the first thing that must be put forward is instilling autonomous public awareness, namely compliance to preserve the environment based on a personal understanding that exists in a person. With personal awareness, one's obedience to protect the environment must be implemented daily. In addition, the type

of autonomous awareness will also stimulate a person's behavior to protect the environment through active action. This awareness does not require coercive efforts to maintain its continuity because awareness to protect the environment is inherent in its objectivity as a human being, so this becomes one of the factors of a green culture that cannot moderate the relationship between environmental consciousness and the adoption of carbon management accounting.

5. CONCLUSIONS

This research proves that green strategy and social capital significantly affect carbon management accounting adoption. Meanwhile, environmental consciousness has no significant effect and green culture cannot moderate the relationship between green strategy, green social capital, and environmental consciousness on carbon management accounting adoption. Contributions in this study are divided into three parts: theoretical, managerial, and regulatory contributions. For theoretical contribution, this research gives four new dimensions and 17 new indicators in measuring the adoption of carbon management accounting according to the Indonesian context so that it can be used as a reference in the adoption of carbon management accounting in companies. The company needs to identify and classify environmental-related costs into four dimensions for managerial contribution. Increasing the adoption of management accounting must be in line with the green strategy established by the company so that it has a vision and mission that are in line with green concepts that support sustainability so that it will encourage companies towards a low carbon economy and can support the achievement of the SDGs. Also, it is necessary to develop human resources who are always willing to share knowledge related to environmental pollution. This can make it easier for companies to adopt carbon management accounting. Then, companies also need to prepare investments by carrying out competency certification in fields related to the environment that can support capabilities and share knowledge within the company on how important the problem of climate change can affect company sustainability. For regulatory contribution, in this study, it can be seen that strategies and social capital that are environmentally friendly have a significant effect, so it is hoped that regulations need to be developed and made more specific to be able to set provisions regarding metrics and targets used to assess and manage risks and opportunities related to climate that are relevant and material so that companies can have a clear reference. Clear the adoption of carbon management accounting can encourage the application of corporate action in reducing the negative impacts of climate change, one of which is the problem of carbon emissions.

There are limitations in this study, namely the subjectivity of respondents when answering the questions in the questionnaire, and the Adjusted R Square value in this study is only 0.567 or 56.7%, so the remaining 43.3% can be explained by other variables not used in this study. For future research, you can increase the number of respondents by expanding the sample in Indonesia and countries such as ASEAN to make the research results more generalizable and comparative. Then, further research can use mixed method research to better understand the research problem by triangulating quantitative and qualitative data. Also, being able to explore participant views or qualitative ones to be analyzed based on a large sample. Then, you can add other research variables that can influence the adoption of carbon management accounting, such as environmental management systems, perceived environmental uncertainty, and decentralization.

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