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GREEN ACCOUNTING, MATERIAL FLOW COST AND ENVIRONMENTAL PERFORMANCE AS PREDICTOR VARIABLES OF CORPORATE SUSTAINABILITY

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Abstract

The main objective of this study is to analyze the effect of implementing green accounting, material flow cost accounting, and environmental performance on corporate sustainability. This study uses stakeholder theory and legitimacy theory. This study uses secondary data obtained by the documentary method. The data source in this study is the annual reports of manufacturing companies listed on the Indonesia Stock Exchange for the period 2018 to 2020. The sample selection was carried out using a purposive sampling method and analyzed using multiple regression analysis. The results of the study show that green accounting has a negative and significant effect on corporate sustainability. MFCA (production costs) has a positive and insignificant effect on corporate sustainability. MFCA (land area of production coverage) has a negative and significant effect on corporate sustainability. MFCA (production value) has a positive and significant effect on corporate sustainability. Environmental performance has a positive and significant effect on corporate sustainability.

Keywords: *Corporate Sustainability, Environmental Performance, Green Accounting, Material Flow Cost Accounting*

1. Introduction

The current concerns regarding pollution and climate change have prompted the development of demands by the public about the role of business in society. Companies are asked to fulfill the need for greater transparency, sustainability and responsibility in business. Industry which is the cause and determinant of the flow of material and energy in society plays an important part in the economy, namely in the development and creation of wealth. For that reason, companies need to play an important role in creating a sustainable future.

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So far, companies that are socially minded and environmentally oriented are recognized as the company's long-term vision. Sustainability-oriented company development is a dynamic business strategy that uses sustainability practices implemented to meet shareholder demands and energize stakeholders to provide support for a company (Tsalis, et al., 2020). Corporate sustainability is becoming an important tool seeking ways to reduce costs, manage risk, create new products, and drive fundamental internal changes in culture and structure. Companies should already be aware that the focus of their activities is not only on their financial performance (profit), but also must pay attention to environmental performance (planet) and social performance (people).

Data for cases in Indonesia, one of the biggest contributors to environmental damage is from industrial activities which are growing rapidly but are not matched by waste management or environmental preservation.(https://www.walhi.or.id/condition-environmental-life-di-indonesia-ditengah-isu-pemanasan-global). In line with the data above, the Ministry of Environment and Forestry (KLHK) assesses that the compliance of the manufacturing sector in environmental management is still low (Nurcaya, 2020). Therefore, in order to pursue profit for the sustainability of the company, businesses need to be dedicated to the environment and society. With governance that is concerned with the interests of society and the environment, it is believed that it will improve the company's performance financially and non-financially, in the long term it is hoped that the company's sustainability will be maintained (Miqdad, 2016: 22)

In order to pursue profits and remain committed to the environment and social as well as achieve sustainability, companies need to develop strategic planning. In addition, companies also need tools that support planning, one of which is through the accounting sector, namely through green accounting. Companies that are able to apply green accounting properly, will easily disclose environmental costs. The environmental costs incurred by this

company will help prevent the possibility of other expenses related to environmental pollution activities through the company's operating activities.

In addition to using green accounting, companies can use management tools in managing the company's production waste. This management tool is known as material flow cost accounting (MFCA). Loen (2018: 3) reveals that MFCA is a method used in management accounting that is designed to make cost efficiency and at the same time reduce negative impacts on the environment in production activities. The MFCA seeks to collect data which is then used to reduce material losses and improve material and energy efficiency. The effectiveness of MFCA is measured through production costs, area of land covered by production, and production value. Another variable that supports corporate sustainability is environmental performance. Environmental performance describes the extent to which the company carries out its environmental compliance. Companies that obtain a good environmental compliance rating will be well-regarded and accepted by society. Acceptance by society will assist the company in maintaining its existence and sustainability through profit creation and environmental and social compliance.

Previous research by Amiruddin (2018) shows that material flow cost accounting related to production costs and output has an influence on green accounting. Meanwhile, material flow cost accounting in this case related to factory area has no effect on increasing company sustainability. Furthermore, in more or less the same theme, Selpiyanti and Fakhroni (2020) investigate the connections between sustainable development and green accounting and material flow cost accounting. According to Selpiyanti and Fakhroni's research findings, material flow cost accounting and green accounting both have an impact on sustainable development. Similarly, Rakesa (2021) found in his research that material flow cost accounting and green accounting might have an impact on a company's sustainability.

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In another section, a literature review conducted by Nwoba, Boso, and Robson (2021) states that in its activities a company is bound by what he calls managerial institutional ties, namely how companies respond, adapt, and react to social and environmental demands and challenges. environment that emerges from the market. This argument is in line with the statement of Wijethilake and Ekanayake (2018) which outlines that organizations must be involved in and adhere to sustainability practices for various reasons due to internal or external factors. An enterprise must properly recognize the different sustainability pressures, whether they are related to social legitimacy or operational efficiency, both internal to the organization and external. Institutional pressures for sustainability include, for example, governments and regulatory agencies (coercive pressure), competitors (mimetic pressure), and professional bodies (normative pressure) (Wijethilake et al., 2017).

For the case in Indonesia, one of the institutions that is very concerned about sustainability in an organization is an independent institution called the Public Disclosure Program for Environmental Compliance-PROPER (https://proper.menlhk.go.id/proper/home).

PROPER is a form of government policy, to improve the company's environmental management performance in accordance with what has been stipulated in the laws and regulations. Furthermore, PROPER is also a manifestation of transparency and democratization in environmental management in Indonesia. The preparation of criteria related to the implementation of PROPER is carried out by the technical team by considering input from various parties, including: district/municipality governments, industry associations, companies, NGOs, universities, related agencies, and the PROPER Advisory Council.

PROPER assessment criteria consist of two categories, namely compliance assessment criteria and beyond compliance criteria. Compliance assessment criteria answer only simple questions. Which confirms how the company complies with environmental

management regulations. The results of the PROPER assessment are confirmed in the company's environmental performance rating. The better the PROPER rating achieved by a company reflects that the company has a major contribution in fulfilling the rights of the public and future generations in which the company operates. Furthermore, this implies that the performance of social and environmental companies is confirmed to be good. Environmental performance reflects how a company makes efforts in order to build the surrounding environment (Ulupui et al., 2020: 746).

By considering the above arguments, this study adds environmental performance variables to all models related to the determinants of company sustainability. The addition of the environmental performance variable was carried out by researchers to obtain empirical evidence on how the environmental compliance rating given by the Ministry of Environment and Forestry affects the company's level of sustainability.

Thus, this research was conducted to investigate how green accounting, material flow cost accounting, and environmental performance affect corporate sustainability. The expected findings from this research can be useful for manufacturing companies in general in improving sustainability through the application of green accounting, and material flow cost accounting, as well as through environmental performance assessments.

2. Literature Review

2.1 Stakeholder Theory

The theoretical model of this research is built on several theories namely stakeholder and legitimacy theory. Stakeholder theory as coined by Edward Freeman around the 1980s (Deegen, 2020) explains stakeholders broadly, namely 'any group or individual who can affect or be affected by the achievement of company goals. These groups are shareholders, employees, customers, lenders, suppliers, local charities, various interest groups and governments. Stakeholders as described

above also include future generations and the environment. Deegan (2020) explains that in stakeholder theory, organizations try to identify stakeholder groups. The main stakeholder groups that receive more attention are related to stakeholders directly related to the continuity of operations and business continuity. The greater the importance of a stakeholder, the greater the expectation that company management will take action to 'manage' the relationship with that stakeholder. Organizations must be able to adapt operating and disclosure strategies. This is important to do in line with the ever-changing expectations and power elativities of various stakeholder groups.

In an effort to uphold accepted standards and values, the stakeholder theory promotes the disclosure of firm output to stakeholders. The company is then believed to be able to increase its value and have a beneficial impact on sustainability. Freeman *et al.,* (2020) stated that apart from being a business planning model, stakeholder theory is a CSR model for stakeholder management. Company planning and analysis is expanded to include external influences such as the influence of the government as a regulator where the government's position has special attention to the company's social and environmental performance. When stakeholder theory attempts to disclose the company's output to stakeholders while adhering to established norms and values, the company is anticipated to add to the company's value and favorably influence sustainability. Ignoring the interests of stakeholders will contaminate the company's image which will further negatively affect the company's financial performance.

2.2 Legitimacy Theory

Furthermore, the theory related to the model to be tested in this study is related to the theory of legitimacy. This theory is very closely related to stakeholder theory. The basic argument in this theory is that an organization consistently strives to act in accordance with the boundaries and norms of the society in which the organization operates. More than that, apart from complying with the norms and limits set

by the local community, the organization must also adapt to all the changes that are taking place and that will occur (Deegan, 2020).

A review conducted by Deegan (2020) states that researchers who use Legitimacy Theory often associate 'legitimacy' with the diction of 'social contract'. The social contract referred to above is a contract between a company and the community where an organization operates its business. Legitimacy formed and accepted by society on the condition that the organization operates according to an agreed 'social contract'. The social contract that has been built contains many implicit and explicit expectations that society has about how an organization should carry out its operations. In summary, legitimacy theory emphasizes that organizations must appear to consider the rights of the public at large, not just investors' interests.

Legitimacy theory encourages organizations to try to build conformity between the social values associated or implied through their activities and the norms of behavior that are acceptable in the larger social system in which the organization is located. Companies must strive to be "legitimate" and accepted in the eyes of society or the place where the company is located (Daromes, Ng, & Legaspi, 2023).

2.3 Theoretical Framework

To achieve sustainability, companies need to be accepted by society so that compliance with community norms and values is an important thing to implement (legitimacy theory). When the values desired by the community are in accordance with the values applied by the company, then the sustainability of the company is not threatened so that the company can run for a long time in order to meet the needs of future stakeholders.

The concept of green accounting is expected to be a new way to improve environmental sustainability because by implementing green accounting, companies voluntarily comply with the rules that apply where the company is

located (Ulupui et al., 2020: 746). For this reason, it can be said that legitimacy theory motivates the use of green accounting in companies. In addition to legitimacy theory, stakeholder theory urges firm management to address the long-term needs of stakeholders. Ulupui *et al.,* (2020) explain green accounting as an effort to use resources efficiently and effectively in a production process. This will improve and achieve sustainable company performance. The company's application of green accounting is expected to be able to improve environmental performance which will be an important measurement in supporting the company's success. Having a proper environmental accounting system helps management by providing a better analysis of environmental costs and can reveal other revenue opportunities.

Furthermore, stakeholder theory encourages companies to meet stakeholder needs in the long term and then encourages companies to achieve sustainability. In this goal, the company seeks to balance the dimensions of sustainability, namely from economic, social and environmental aspects. In achieving this balance, the most relevant tool that companies need is material flow cost accounting which allows companies to increase productivity but at the same time reduce the impact on the environment. Material flow cost accounting (MFCA) is measured through a 3-dimensional calculation, namely production costs, production coverage land area, and production value. The use of MFCA is an important point for the development of corporate sustainability. This is in line with research by Marota (2017); Loen (2018) which revealed a positive influence between MFCA and sustainability.

Material flow cost accounting (MFCA) promotes transparency of material usage practices through the development of material flows that track and measure a company's material flows and stocks in physical and monetary units. When these physical and monetary data are readily available through the MFCA, they can be used to reduce material losses, increase the efficient use

of materials and energy, and reduce adverse environmental impacts and costs. This study uses a 3-dimensional measurement to measure MFCA which consists of production costs, area of land covered by production, and production value (Rakesa, 2021). Measures of production costs and value use monetary units in the form of rupiah units (Marota, 2017). The size of the land area covered by production uses area units in square meters (Rakesa, 2021).

The last predictor in this research model, namely environmental performance resulting from standardized measurements from the government through PROPER, arises as a result of community demands for companies to be able to comply with the rules and norms that apply in society to protect the environment where the company is located. So that it can be said that legitimacy theory encourages companies to follow the rules of the surrounding environment so that they can be accepted by society and company sustainability can be achieved. Environmental performance is also driven by stakeholder theory where stakeholders need information on environmental performance. Research by Supadi and Sudana (2018) shows the positive effect of environmental performance on company sustainability disclosures.

For companies in Indonesia, the measurement of environmental performance is carried out based on standards from the Ministry of Environment and Forestry of the Republic of Indonesia through its program called "Company Performance Rating Program in Environmental Management" or abbreviated as PROPER. Ulupui *et al.*, (2020: 746) emphasized that various efforts to develop and improve corporate environmental performance are expected to encourage companies to create their own environmental preservation initiatives. These efforts make it possible to encourage sustainable company performance. This study uses a scoring system based on the PROPER level given to companies (Ulupui et al., 2020). Environmental

performance measurements based on PROPER.

Sustainability is the basis for the development of the global framework debate in which the satisfaction of sustainable human needs is the ultimate goal. When this thought is incorporated into business thinking, corporate sustainability by Dyllick & Hockerts (2017: 131) is defined as a meeting point that meets the needs of all stakeholders without compromising the company's ability to meet stakeholder needs in the future. Companies need to maintain and develop their economic, environmental and social while actively contributing to corporate sustainability. In this case, companies need to integrate their economic, environmental and social aspects as in the triple bottom line concept. To be sustainable (long term), companies must be financially secure, reduce or ideally eliminate negative impacts on the environment and act in accordance with societal expectations.

In this study, corporate sustainability variables were measured using economic, environmental and social dimensions and indicators in previous studies by Marota (2017); Rakesa (2021).

2.4 Hypothesis Development

2.4.1 Green Accounting Implementation and Corporate Sustainability

Companies are encouraged to implement environmentally friendly industrial practices. In accounting practice, the company uses a tool in the form of green accounting. Green accounting requires accounting as accounting that does not only focus on profits but also on people and the earth (Andi *et al.*, 2020:63). Achieving sustainability for the company will be difficult to achieve if the company ignores or even ignores environmental and social issues. One way to assist companies in achieving sustainability is by implementing green accounting.

Green accounting is designed to integrate environmental costs into the financial results of a company's business. The important message of this statement is that companies must invest large environmental costs to achieve economic benefits from implementing green accounting (Dhar, Sarkar, and Ayittey,

2022). Consequently, companies need to disclose this aspect of information completely and honestly. This process can help increase information sharing between the company and external stakeholders, and relevant stakeholders. And then the resulting financial reports are more accurate, especially related to green accounting information. The preceding procedures and decisions are primarily related to investment and financing, which are more valuable and have a big impact on the company's sustainability (Arrive and Feng, 2018).

Research by Rakesa (2021) found that the application of green accounting has a positive effect on corporate sustainability. Companies use green accounting as an accounting tool that helps disclose environmental performance. Selpiyanti and Fakhroni (2020) in their research revealed that companies that implement green accounting by incurring costs for environmental preservation and disclosing them in an annual report will make a significant contribution in increasing sustainability development. The descriptions of the explanations and research findings above are the basis for developing the following hypotheses:

H_1: Green accounting has a substantial impact on company sustainability.

2.4.2 MFCA (Production Costs) and Corporate Sustainability

MFCA can be described as a management accounting tool by which companies manage material and energy use effectively by enhancing existing practices. The important theme is how to minimize costs through reducing waste which leads to increased business productivity. MFCA provides a basis for companies to seize opportunities to increase eco-efficiency (Doorasamy, 2016). Riwayadi, (2016) states that this process is attached to how the management of raw materials into finished goods.

Crutzen, Zvezdov and Schaltegger (2017) explains that the importance of environmental awareness and sustainability in managing material use, decreased access to various resources, and increased costs for handling, storage and disposal of waste have created a demand for increased material efficiency. Abdullah & Amiruddin (2020) in their research also revealed that MFCA (production costs) has an effect on increasing company

sustainability. Crutzen, Zvezdov and Schaltegger (2017) stated that research conducted on the manufacturing sector shows that material use accounts for 40-80 percent of total expenditure. There is an awareness of the environment as well as material efficiency that leads to business productivity and sustainability, reflecting an MFCA that focuses on the balance of profit, planet and people so that it can operate in the long term to meet stakeholder needs.

Abdullah and Amiruddin (2020) in their research also revealed that MFCA (production costs) has an effect on increasing company sustainability. Another study conducted by Alfian *et al.*, (2020) on the application of MFCA at PT Unipres Indonesian found that by identifying the production process, production flow, and production output, PT Unipres Indonesian treats residual production waste to third parties. The sale of this waste adds to the company's income which contributes to financial performance. From this it can be seen that in terms of production costs, MFCA reduces waste that is disposed of in vain through resale and increases profits for the company.

Company management that is able to reduce production costs along with reducing waste and increasing profits through the implementation of MFCA fulfills the triple bottom line requirements. By fulfilling these requirements, the company also fulfills the aspects needed in the sustainability dimension. Accordingly, the next hypothesis is:

H_2: The impact of MFCA (production costs) on company sustainability is substantial.

2.4.3 MFCA (Land Area of Production Coverage) and Corporate Sustainability

One of the tools developed by management accounting for calculating waste that provides financial and non-financial information to support waste reduction decisions by management is called material flow cost accounting (Marota, 2017:44). Measurement of MFCA can be done using the variable area of production land. This

measurement is based on research conducted by Marota (2017). Land is defined as a place where products are produced which is an important factor of production that affects the amount of production.

Measurement of MFCA can be done using the variable area of production land. This measurement is based on research conducted by Marota (2017). Land is defined as a place where products are produced which is an important factor of production that affects the amount of production. Companies that are able to maximize land use for production coverage are expected to be able to maximize production levels in relation to increased profitability. By increasing profitability, the company is expected to be able to maintain its existence in a sustainable manner.

Stakeholder theory encourages companies to achieve sustainability in meeting sustainable needs so that companies need to carry out the concept of a balance between profit, people and planet. Consequently, the MFCA idea provides tools to increase productivity and profit (internal influence) and positively affect the environment (external influence), thereby enhancing the sustainability of the business. (Marota, 2017:44). Companies that are able to maximize land use for production coverage are expected to be able to maximize production levels in relation to increased profitability. By increasing profitability, the company is expected to be able to maintain its existence in a sustainable manner.

Research that examines the effect of land area on productivity was conducted by Arimbawa and Widanta (2017) stating that land area has a positive effect on productivity. The results of this study are not in line with research by Marota (2017); Abdullah and Amiruddin (2020). Research by Marota (2017) conducted on medical device companies revealed that the results of the t test showed that when each dimension of the MFCA variable was tested for corporate sustainability, it could not affect the company's sustainability variables individually with

a significant effect. According to Abdullah and Amiruddin (2020), the land area component of production coverage has no effect on the company's sustainability, which threatens sustainability. Therefore, the next hypothesis can be developed:

H_3: MFCA (land area covered by production) has a significant effect on corporate sustainability.

2.4.4 MFCA (Production Value) and Corporate Sustainability

The variables used to measure MFCA besides production costs and the area of land covered by production are production value variables. This is based on research indicators regarding the effect of MFCA on corporate sustainability by Ulupui *et al.,* (2020) Selpiyanti and Fakhroni (2020) in their research on the palm oil industry revealed the results of their research that the MFCA in the yield/production value dimension has a positive and significant effect on enhancing sustainable development.

MFCA provides information on transparency of material flows and energy flows, including supporting management decision making related to increasing efficiency in the use of materials, energy, labor, and waste treatment (Marota, 2017: 50). The variables used to measure MFCA besides production costs and the area of land covered by production are production value variables. This is based on research indicators regarding the effect of MFCA on corporate sustainability by (Ulupui *et al.,* 2020). Additionally, Ulupui *et al.,* (2020) defines production value as "the entire level of a production which is based on the selling price of these products using production factors owned by the company in one period which will eventually be sold to buyers".

Still the same as the other dimensions of MFCA assessment, the stakeholder theory that promotes sustainability is in line with the concept of MFCA measurement which measures production value. This can be explained by the logic of thinking that companies with high production values are able to earn profits and by using MFCA which

reduces waste, companies are also able to contribute to environmental aspects in relation to company sustainability.

Selpiyanti and Fakhroni (2020) in their research on the palm oil industry revealed the results of their research that the MFCA in the yield/production value dimension has a positive and significant effect on enhancing sustainable development. According to Abdullah and Amiruddin (2020), measuring MFCA through the production value dimension has a good influence on boosting company sustainability, which contributes to the development of corporate sustainability. Based on the arguments and findings of these studies, the following hypotheses are based:

H_4: MFCA (production value) has a significant effect on corporate sustainability.

2.4.5 Environmental Performance and Corporate Sustainability

The existence of a company in the midst of society is indirectly influenced by the expectations and perceptions of the community regarding company activities (Deegen, 2020). Communities need to see how the company operates and how its activities affect the environment in which the company is located. This then strengthens the idea that the company's annual report is a public relations document used by management to provide a positive picture of the company's social and environmental performance.

Environmental performance itself is defined as a form of company effort in realizing environmentally friendly business processes (Rosaline and Wuryani, 2020: 571). The Ministry of Environment and Forestry uses the company's participation in the PROPER program as a proxy for its environmental performance. There are five levels in the PROPER level, ranging from the highest GOLD level to the lowest BLACK level.

Legitimacy theory focuses on the relationship between companies and society where organizations try to equate perceptions of corporate values with norms in the social system of society. Disclosure of the company's environmental performance is considered as a medium of dialogue between the company and the

community so that the company gains legitimacy for its environmental management system (Deegen, 2020). In order to achieve legitimacy, the company tries to reduce the legitimacy gap between the company and the community.

According to research by Antara et al. (2020) and Supadi and Sudana (2018), environmental performance improves sustainability reporting. Dewi and Yasa (2017) found that environmental performance positively impacted environmental disclosure, staying within the context of environmental performance studies. Companies that perform well in terms of the environment will gain favor with the public. When public opinion of the company rises, the company's position in the eyes of the public will be good (Dewi and Yasa, 2017). From the results of this study the authors understand that good environmental disclosure will positively affect sustainability. The hypothesis is stated as follows in light of the given explanation:

H_5: Environmental performance has a significant effect on corporate sustainability.

3. Research Methods

3.1 Population and Sample

This research was conducted at manufacturing companies listed on the Indonesia Stock Exchange from 2018 to 2020. Sampling using this method is a purposive sampling technique using certain criteria. The sample selection criteria in this study are as follows. First, manufacturing companies were listed on the Indonesia Stock Exchange (IDX) during the 2018 to 2020 period and did not experience delisting during that period. The second is manufacturing companies listed on the Indonesia Stock Exchange (IDX) that have participated in PROPER during the 2018 to 2020 period. The last one is manufacturing companies listed on the Indonesia Stock Exchange (IDX) which publish complete financial reports and have complete data related to the variables used in the study.

3.2 Measurement of Variables

3.2.1 Green Accounting

$$GA_j = \frac{\Sigma X_{ij}}{n_j} \quad \text{..... (1)}$$

Which, GA_j is *green accounting company j*, n_j is the number of items for the company j, ΣX_{ij} represent the total amount of green accounting disclosures by companies. Furthermore, the dummy variable is explained as follows, namely the number 1 indicates if item *i* is disclosed, and vice versa the number 0 if item *i* is not disclosed.

3.2.2 Material Flow Cost Accounting

Data collected through MFCA is used by companies to reduce material use, material losses and increase the efficiency of resource use. This study uses 3-dimensional measurements to measure MFCA which consists of production costs, area of land covered by production, and production value (Marota, 2017; Amiruddin, 2018; Rakesa, 2021). The regression equation model through 3-dimensional measurements is explained as follows:

The formula for calculating production costs is as follows:

$$BP = BBB + BTK + BOP \quad \text{..... (2)}$$

With the following explanation, namely BP is the Cost of Production, BBB is the Cost of Raw Materials, BTK is Labor Cost, and finally BOP is Factory Overhead.

The formula for calculating the area of land covered by production is as follows:

Production Covered Land Area= Number of Square Meters of Factory Are … (3)

The measurement of the next variable is related to Production Value. Production value is an assessment of the product based on its production factors which are used to determine a fair selling price to the buyer. The measure of production value uses monetary units in rupiah units (Rakesa, 2021). The formula for calculating production value is as follows:

Production Value = Cost of Goods Sold … (4)

3.2.3 Environmental Performance

This environmental performance measurement has been established by the Ministry of Environment and Forestry through PROPER. This study uses a scoring system based on the

PROPER level given to companies (Supadi and Sudana, 2018); Ulupui et al., 2020). Environmental performance measurements based on PROPER are as follows:

Table 1. Environmental Performance based on PROPER Assessment

Color	Score	Performance Level
Gold	5	Very good
Green	4	Good
Blue	3	Fair
Red	2	Poor
Black	1	Very bad

Table 1 above describes the ranking of environmental performance assessments with various colors with their respective scores and levels of performance achievement as follows. The gold color has a score of 5 and indicates excellent environmental performance; Green is worth 4 which means good performance; Blue has a score of 3 which is a fair performer; Red has a score of 2 which means poor performance; and the last one is black with a score of 1 which means very poor performer.

3.2.3 Corporate Sustainability

In this study, corporate sustainability variables were measured using economic, environmental and social dimensions and indicators in previous research by Marota (2017) and Rakesa (2021). The first dimension is the economic aspect which consists of three indicators related to sales, net profit and investment. The second dimension is the environment which consists of 3 indicators, namely waste management fees, utility expenses, and salary expenses. The last dimension is social, which consists of indicators of benefits and pension costs and corporate social responsibility expenses.

4. Results and Discussions

4.1 Sample Selection Process

The research object used as the population in this study is a manufacturing company listed on the Indonesia Stock Exchange. This study uses a purposive sampling method, and the variables contained in this study are green accounting, material flow cost accounting (production costs, land area of production coverage, and production value), and environmental performance. An overview of the sample selection process is shown in table 2 below.

Table 2, Sample Selection Summary

Information	Number of Companies
Manufacturing companies listed on the Indonesia Stock Exchange (IDX) in 2018-2020	166
Criteria: Manufacturing companies listed on the Indonesia Stock Exchange that did not participate in PROPER activities in 2018-2020	(122)
Manufacturing companies listed on the Indonesia Stock Exchange do not have complete data related to the variables used in the research	(29)
Number of sample companies	15
Total company data for 2018-2020	45
Outliers Data	(14)
Total research data	31

Source: processed in research (2023)

The results of the data search show that there are 166 manufacturing companies listed on the Indonesia Stock Exchange (IDX) in 2018-2020. Furthermore, manufacturing companies that did not participate in PROPER activities in 2018-2020 are 122 and data on companies that do not have complete data related to variables. Furthermore, there are 29 manufacturing companies listed on the Indonesia Stock Exchange that do not have complete data related to the variables used in the study. Thus, the number of companies that are processed further is 15 sample companies and multiplied over a period of 3 years, which is 45 samples. However, of the total samples, there were 14 samples that were declared outliers, thus the total data that was further processed amounted to 31 sample companies.

Table 3, Descriptive Statistics

Variables	N	Mean	Standard Deviation	Minimum	Maximum
Green Accounting	31	0.547	0.171	0.130	0.880
MFCA (Production cost)	31	1,253,264,019,861.810	1,626,626,797,568.240	164,450,865,000	8,629,171,000,000
MFCA (Area of Production Covered Land)	31	163,608.160	191,218.010	9,135	869,542
MFCA (Production Value)	31	1,115,705,170,347.810	857,051,752,287.990	179,156,903,000	3,935,894,000,000
Environmental Performance	31	3.030	0.180	3	4
Corporate Sustainability	31	1,451,444,786,221.050	846,903,580,063,050	404,765,098,992	4,529,782,850.920

Source: processed in research (2023)

This study used 31 samples from 15 manufacturing companies that were included in the sample selection criteria. Table 3 shows the results of the descriptive statistical test for each research variable. The results of green accounting analysis have a minimum value of 0.130, a maximum value of 0.880 with an average value of 0.547 and a standard deviation value of 0.171. Material flow cost accounting-MFCA (production costs) has a minimum value of 164.450,865,000 with a maximum value of 8,629,171,000,000 with an average value of 1,253,264,019,861.810

and a standard deviation value of 1,626,626,797,856.240.

MFCA (land area of production coverage) has a minimum value of 9,135, a maximum value of 869,542 with an average value of 163,608.160 and a standard deviation value of 191,218.010. This shows that the sample companies in this study have an average production area of 163,608.160. Material flow cost accounting (production value) has a minimum value of 179,156,903,000 with a maximum value of 3,935,894,000,000 with an average value of 1,115,705,170,347.810 and a standard deviation value of 857,051,752,287.990.

Environmental performance has a minimum value of 3, a maximum value of 4 with an average value of 3.030 and a standard deviation value of 0.180. This indicates that the sample companies in this study have an environmental performance score of 3 points, namely a blue rating (environmental performance level "Fair"). Corporate sustainability has a minimum value of 404,765,098,992, a maximum value of 4,529,782,850,920 with an average value of 1,451,444,786,221.050 and a standard deviation value of 846,903,580,063,050. This shows that the sample companies in this study have corporate sustainability values (economic dimensions, environmental dimensions, and social dimensions) of 1,451,444,786,221.050.

The next analysis will show the results of the determination coefficient test (table 4); testing the research model (F test) as shown in table 5, and the last one related to the results of the regression testing of each hypothesis shown in table 6. The test results are presented as follows.

Table 4. Test Results for the Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimated
1	0.874	0.765	0.717	0.12286

Source: processed in research (2023)

The test results for the coefficient of determination in table 4 above show an Adjusted R Square value of 0.717. This value indicates that 71.7 percents of the variation in corporate sustainability can be explained by variations in green accounting, material flow cost accounting (production costs,

land area of production coverage, and production value), and environmental performance. While the remaining 28.3 percents is explained by variables outside this research model.

Table 5. Simultaneous Test Results (Test F)

Model		Sum of Squares	d.f	Mean Square	F	Sig.
1	Regression	1.226	5	0.245	16.238	0.000
	Residual	0.377	25	0.015		
	Total	1.603	30			

Source: processed in research (2023)

The results of the F test in table 5 above show a significance value of 0.000 and less than 0.005. This shows that green accounting, material flow cost accounting (production costs, land area covered by production, and production value),

Table 6. Results of Multiple Regression Analysis

Model	Unstandardized Coefficients		Unstandardized Coefficients	t	Sig	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	5.260	.902		5.832	.000		
GA	-.371	.147	-.271	-2.518	.019	.814	1.228
BP	0.167	.139	.311	1.200	.241	.141	7.112
LLCP	-.144	.050	-.343	-2.900	.008	.671	1.490
NP	0.360	.170	.549	1.120	.044	.141	7.117
EP	2.430	1.162	0.236	2.091	.047	.740	1.350

Source: processed in research (2023)

Note:

Corporate Sustainability is denoted by CS, Green Accounting by GA, Cost of Production by BP, Production Covered Land Area by LLCP, Production Value by NP, and Environmental Performance by EP.

Based on the results of the data analysis above, the regression model equation is arranged as follows:

$$CS = 5.260 - 0.371GA + 0.167BP - 0.144LLCP + 0.360NP + 2.430EP + e$$

The constant value (a) has a positive value of 5.260 which indicates that there is a unidirectional influence between the independent variable and the dependent variable. This shows that if all independent variables do not change, then corporate sustainability is worth 5.260. The value of the green accounting regression coefficient is -0.371, which means that if the level of application of green accounting increases by 1 unit, it will reduce corporate sustainability by 0.371 units assuming other variables are constant.

Assuming that all other variables remain constant, the regression coefficient value for MFCA (production costs) is 0.167, which suggests that if the level of MFCA (production costs) implementation increases by 1 unit, it will raise corporate sustainability by 0.167 units. MFCA (production

coverage land area) is -0.144, which means that if the level of application of MFCA (production coverage land area) increases by 1 unit, it will reduce corporate sustainability by 0.144 units assuming other variables are constant. The regression coefficient value of material flow cost accounting (production value) is 0.360, which means that if the level of implementation of MFCA (production value) increases by 1 unit, it will increase corporate sustainability by 0.360 units assuming other variables are constant. The value of the environmental performance regression coefficient is 2.430, which means that if the level of application of the environmental performance regression increases by 1 unit, it will increase corporate sustainability by 2.430 units assuming other variables are constant.

4.2. Discussion

4.2.1 Green Accounting Implementation and Corporate Sustainability

Table 6 shows the effect of green accounting on corporate sustainability of -2.518 with a significance probability of 0.019, so it can be concluded that green accounting has a negative and significant effect on corporate sustainability. Therefore, H1, which asserts that green accounting has a major impact on company sustainability, is acknowledged.

Abdullah and Amiruddin (2020) stated that green accounting provides motivation to reduce environmental costs which will affect the basic decisions of the company's existence in the future. However, in this study it was found that green accounting reduces the company's sustainability ability. The application of green accounting, which costs a lot of money to implement, reduces the economic capacity needed by companies in their sustainability process.

The ineffective application of green accounting accompanied by the use of large fees results in an even greater burden on the environment. The imposition of these large costs will

reduce the capital owned by the company. Capital that should be prioritized for the production process to increase company profits is used for the implementation of green accounting. Especially considering the period in this study in 2020 which was affected by a decline in economic capacity due to Covid-19. The company's financial capability has decreased due to declining sales levels. This decline was exacerbated because the implementation of green accounting required a lot of money. Therefore, the implementation of green accounting in this research period actually affects the economic dimension of company sustainability negatively and significantly.

Stakeholder theory which explains stakeholders as parties who influence and are affected by company activities will certainly pay attention to aspects of corporate sustainability. This study shows that the green accounting disclosure items contained in company reports, the lower the level of corporate sustainability. Disclosure of items in accordance with the GRI Standards in the annual report is in fact not viewed well by stakeholders. In this case, the implementation of green accounting which is intended to increase the environmental dimension of sustainability, is seen as reducing the company's financial dimension because the process of implementing green accounting is very costly. Declining financial capability will negatively affect the company's sustainability and stakeholders will see this as a negative signal to the company's sustainability.

The results of this study are in line with the research of Rosaline & Wuryani (2020) which found that green accounting has a negative effect on economic performance in industrial and chemical sector companies. However, this research is not in the same direction but is in line with Rakesa's research (2021) which found that green accounting has a positive and significant effect on corporate sustainability.

4.2.2 Material Flow Cost Accounting (Production Costs) and Corporate Sustainability

Table 6 shows the effect of MFCA (production costs) on corporate sustainability of 0.311 with a significance probability of 0.241, so it can be concluded that MFCA (production costs) has a positive but not significant effect on corporate sustainability. Thus, H2 which states that MFCA (production costs) has a significant effect on corporate sustainability is rejected. This shows that production costs can positively affect company sustainability, although not significantly.

Expenditure on production costs in MFCA has a positive effect on sustainability but the effect is not significant. Production costs provide information about the overall costs directly related to the product. These production costs consist of raw material costs, direct labor costs, and factory overhead costs. Determining production costs in material flow cost accounting should help companies to use raw materials efficiently in their production processes thereby reducing capital expenditures for financing raw materials and reducing waste in the production process.

In this study, the material flow cost accounting assessed through production costs has a positive, although not significant, effect on overall sustainability. It is possible that production costs affect only one of the dimensions of sustainability. This non-simultaneous influence ultimately makes the effect of production costs on sustainability weak or insignificant.

Stakeholder theory where companies try to disclose company output to stakeholders, trying to add to company value and positively influence sustainability. Companies that ignore the interests of stakeholders will pollute the company's image which will further negatively affect the company's financial performance (Abdullah and Amiruddin, 2020: 169). Production costs through material flow cost accounting are not able to significantly influence corporate sustainability because stakeholders see

production costs as not reflecting overall sustainability capabilities. Determining the right production costs through material flow cost accounting influences corporate sustainability positively, although only partially.

4.2.3 Material Flow Cost Accounting (Land Area of Production Coverage) and Corporate Sustainability.

Table 6 shows the effect of MFCA (production area of land) on corporate sustainability of -0.343 with a significance probability of 0.008, so it can be concluded that MFCA (production area of land) has a negative and significant effect on corporate sustainability. Thus, H3 which states that MFCA (land area of production coverage) has a significant effect on corporate sustainability is accepted.

According to this study, material flow cost accounting (land area coverage) has a negative and considerable impact on a company's ability to remain sustainable. In actuality, the wider the company's land holdings are, the worse it is for the company's sustainability.

The land area for production coverage uses area units in square meters (Rakesa, 2021), regarding how companies use their area, arrange the layout of factories and their facilities in increasing company productivity. Maximum use of land area through material flow cost accounting should help companies improve the area in order to increase productivity. In this study, in fact, the area of production coverage affects the sustainability aspect negatively and significantly. In fact, a large land area does not guarantee a high level of productivity, in this case the economic dimension of company sustainability is negatively affected. The wider the production land owned by the company, the higher the maintenance costs in the form of environmental care that must be incurred by the company to cultivate the land. This cost will affect the company's expenses where the ability of the economic dimension will eventually decrease. In addition, with a large land area, it will be difficult for

companies to choose the best layout to increase their productivity. Often, companies only focus on the size of the area but not on its utilization. Especially if the land used reduces open areas and community residential areas.

According to Legitimacy Theory, people are motivated to be accepted and liked by society (Deegen, 2020). Acceptance of the company by the community is needed so that the company needs to carry out its social and environmental responsibilities with the larger goal of corporate sustainability. In this study it was found that the larger the land area will negatively affect sustainability. Companies with large land areas in fact reduce the value of sustainability due to negative responses from the community. The results of this study are in line with the results of research by Marota (2017) who found that material flow cost accounting (land area of production coverage) has a negative effect on company sustainability. However, the results of this study are not in the same direction and are not in line with the results of research by Abdullah & Amiruddin (2020) which found that material flow cost accounting assessed through the area of land covered by production has a positive but not significant effect on the sustainability of the company.

4.2.4 MFCA (Production Value) and Corporate Sustainability

Table 6 shows the effect of MFCA (production value) on corporate sustainability of 0.549 at a significance probability of 0.044. Based on these results it can be concluded that MFCA (production value) has a positive and significant influence on corporate sustainability. Thus, H4 which states that MFCA (production value) has a significant effect on corporate sustainability is accepted.

MFCA (production value) has a positive and significant effect on corporate sustainability. This shows that the value of production tends to affect the level of sustainability significantly. The higher the production value produced by the company, the level of

sustainability of the company also increases.

Production value reflects the company's ability in its production process. The production value determines the fair selling price to the buyer. The increase in production value increases the selling price of the products marketed by the company. The increase in selling price will be in line with the increase in revenue which will positively affect the company's financial capability. The increase in financial capability then affects the economic dimension of the company's sustainability assessment. Material flow cost accounting in this case assists companies in determining maximum and efficient production values and minimizing the level of waste production that appears in the production process.

Stakeholder theory where the company tries to meet the needs and expectations of stakeholders in the long term, through the implementation of material flow cost accounting, stakeholder expectations for the company can be achieved through increasing the financial capacity and environmental capabilities of companies that are trying to reduce waste as a form of company concern for the environment. Increased financial capability and environmental capability will positively affect the company's sustainability and stakeholders will see this as a positive signal for the company's sustainability.

The findings of this study are consistent with those of Dewi and Yasa's (2017) investigation, which discovered that the use of material flow cost accounting via the valuation of production values has a favorable and significant impact on business sustainability. This research is also in line with and in line with Abdullah & Amiruddin's research (2020) which found that the application of material flow cost accounting (production value) in mining companies has a positive and significant effect on company sustainability. However, the results of this study are not in line with research by Marota (2017) who found that the application of material flow cost

accounting through the assessment of production values does not have a significant effect on corporate sustainability.

4.2.5 Environmental Performance and Corporate Sustainability

Table 6 shows the effect of environmental performance on corporate sustainability of 0.236 at a significance probability of 0.047. Based on these results it can be concluded that environmental performance has a positive and significant influence on corporate sustainability. Thus, H5 which states that environmental performance has a significant effect on corporate sustainability is accepted.

The results of this study indicate that environmental performance has a positive and significant effect on corporate sustainability. The higher the environmental compliance assessment rating obtained by the company, the higher the level of sustainability of the company. Environmental performance is assessed through the Rating Program for Company Performance Ratings in Environmental Management (PROPER) by the Ministry of Environment. Through PROPER, the company's environmental performance is assessed and given a rating starting from the lowest rating, namely Black rating, to the highest rating, namely gold rating. Through this ranking, the company then forms a good image and reputation in the eyes of the public and stakeholders. Public opinion that is formed positively then helps the company in corporate sustainability.

Environmental performance is used as a reference for the level of contribution of the company's concern for the environment. The company tries to reduce the negative impact of all business processes that are carried out. The company ensures that its business activities comply with applicable environmental regulations. Environmental performance forms positive public opinion which then influences overall sustainability both in terms of the economic dimension, the social dimension, and the environmental dimension.

This research is consistent with the theory of legitimacy in which environmental performance reflects the company's seriousness in regulating its activities and environmental impacts. Companies that are seen as being able to take good care of the environment will be able to be accepted by the community because their business activities do not threaten the community's environment. This acceptance will positively affect the company's sustainability.

The results of this study are in line and in line with research by Supadi and Sudana (2018) who found that the application of environmental performance in manufacturing companies has a significant effect on economic performance and disclosure of sustainability reports. This research is also in line with research by Rosaline and Wuryani (2020) which found that the application of environmental performance in manufacturing companies in the basic industrial and chemical sectors has a significant effect on economic performance.

5. Conclusions

MFCA (production costs) has a positive but not significant effect on corporate sustainability. Materials costs are only one of four costs that can be generated from an MFCA. Material costs on the other hand are also a small part of the production costs used as an evaluation of the implementation of MFCA in this study. For this reason, the determination of production costs plays only a small role in the overall implementation of MFCA, so it is unable to reflect sustainability. Corporate sustainability is adversely affected and significantly impacted by MFCA (land area of production covering). This is due to the large area of production land without being accompanied by a high level of productivity, making the impact on sustainability negative. Utilization of land area must be utilized and managed properly. Land area without proper utilization and layout has a negative effect if it is not strategic for the company. The best layout is to increase productivity.

MFCA (production value) has a positive and significant impact on corporate sustainability. The increase in production value increases the selling price of the product which will be in line with the increase in revenue which will affect the

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company's financial capability which then affects the economic dimension of the company's sustainability assessment. MFCA in this case assists companies in determining maximum and efficient production values and minimizing the level of waste production that appears in the production process.

Environmental performance has a positive and significant influence on corporate sustainability. The higher the environmental compliance assessment rating obtained by the company, the higher the level of corporate sustainability. This is because environmental performance forms a good image and reputation in the eyes of society and forms positive public opinion so that the company is accepted by society. This acceptance by the community then influences overall sustainability.

This study strengthens the stakeholder theory put forward by Freeman *et.al.,* (2020). This theory is based on the principle that stakeholders have the right to information related to the company. Corporate sustainability is needed to be able to meet the needs and expectations of stakeholders in the long term. For the purpose of sustainability, the company does not only focus on the company's financial capabilities but also on social and environmental capabilities which are now a concern for stakeholders.

When stakeholder theory tries to disclose the company's output to stakeholders, the company tries to manage and achieve stakeholder expectations by delivering environmental and social activities (Sulistiawati and Dirgantari, 2016). Corporate sustainability is needed to be able to meet the needs and expectations of stakeholders in the long term. For the purpose of sustainability, the company does not only focus on the company's financial capabilities but also on social and environmental capabilities which are now a concern for stakeholders. Implementation of material flow cost accounting and environmental performance assessment is a way for companies to achieve corporate sustainability.

This research also contributes to strengthening legitimacy theory (Martens and Bui, 2023). This theory is based on the principle that companies must strive to be "legitimate" and accepted in the eyes of society or the place where the company is located. Community acceptance will help the company in the sustainability process. These environmental activities are then regulated in the implementation of green accounting and material flow cost

accounting as well as environmental performance assessment (Cheng and Kong, 2022).

The company becomes aware of all environmental activities that have an impact on the community environment. According to research and data analysis, green accounting has a negative and considerable influence on the sustainability of businesses. In its implementation, the application of green accounting uses large costs. The imposition of these large costs will reduce the capital owned by the company. The implementation of green accounting is then seen as an additional expenditure that has a negative impact on the company's economic capacity and further has a negative impact on the company's sustainability. This decline in economic capacity was also exacerbated by the impact of Covid-19 during the study period.

In addition to the theoretical implications, this research is expected to provide consideration to investors in conducting an analysis so that it is more accurate and complete for a company. Information regarding corporate sustainability is expected to assist investors in considering and making decisions about companies to invest in. Investors in this case can obtain more information before making an investment. In line with the above arguments, this research is also expected to be able to provide a reference for companies in considering the use of green accounting, material flow cost accounting, and environmental performance to improve corporate sustainability. Companies must choose the best and most effective management tools to achieve sustainability.

This research is also expected to provide benefits for regulators as reference material to evaluate policies that have been made. In addition, this research is also expected to support regulators in making effective new regulations in order to encourage corporate commitment to environmental protection and preservation.

Future research should consider adding other environmental performance measurements such as ISO 14001 certification which is a form of company concern for the surrounding environment. Another aspect recommended in future research is to consider other dimensions of sustainability such as the technological dimension in addition to the economic, environmental and social dimensions to describe overall sustainability (*see.* Hafez, et.al, 2023).

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