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Green Accounting And Material Flow Cost Accounting (MFCA) For The Sustainable Development Of Palm Oil Companies In Indonesia

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ABSTRACT

The MFCA concept is anticipated to introduce a new approach in supporting the achievement of the SDGs, particularly in the environmental sector. This study aims to explore the impact of implementing green accounting and material flow cost accounting on the sustainable development of oil palm plantation companies in Indonesia. The data analysis method employed is multiple linear regression. The findings indicate that both green accounting and material flow cost accounting (MFCA) have a positive and significant influence on the sustainable development of palm oil plantation companies in Indonesia. Companies that incorporate green accounting into their financial reporting not only gain public trust but also enhance their ability to operate sustainably. This highlights that aligning corporate growth with environmental stewardship can significantly contribute to long-term business sustainability. Consequently, stakeholders should advocate for companies to prioritize environmental protection and social responsibility alongside profitability.

INTRODUCTION

Companies are required to improve and improve their performance by increasing their productivity (Trinugroho et al., 2022). Companies in their production processes must also be capable developing sustainable concepts and environmentally friendly industries that are integrated, comprehensive and efficient(Masocha, 2019; Zhang et al., 2020). Problems arising from a company in terms of increasing production, namely problems in the dimensions of company sustainability such as economic, technological, social and environmental(Marota, 2017). Starting from the level of efficiency and effectiveness of production costs as well as the waste production process(Marota et al., 2015). Thus, there needs to be harmony between company development and environmental functions to contribute to company sustainability. This is because production activities carried out by companies over a long period of time certainly require natural resources and also human resources. This condition shows that

company management not only achieves its main goal (profit), but also needs to protect, maintain and improve human resources and natural resources which are important for future sustainability.

A company is not an entity, which only operates for its own interests, but the company must provide benefits to stakeholders(Zhang et al., 2020).Therefore, to achieve corporate sustainability companies must recognize environmental and social issues, which are then included in strategic planning(Astuti et al., 2022). In connection with this, companies need a tool that can support the company's commitment to the environment and social to achieve corporate sustainability(Dura & Suharsono, 2022).One accounting tool that can support a company's commitment to the environment and social to achieve corporate sustainability is green accounting (Selpiyanti & Fakhroni, 2020). This statement is supported by research results that the implementation of green accounting has a positive and significant effect on sustainable development(Loen, 2019; Selpiyanti & Fakhroni, 2020).

Green Accounting is a concept where companies in their production processes prioritize efficiency and effectiveness in the use of resources in a sustainable manner, so that they are able to align company development with environmental functions and can provide benefits to society(Loen, 2019). Environmental accounting functions are divided into internal and external functions. The internal function makes it possible to manage and analyze the costs of environmental preservation compared to the benefits obtained, as well as considering effective and efficient environmental preservation through appropriate decision making. External functions allow the company to influence stakeholder decision making(Lusiana et al., 2021). It is hoped that the publication of environmental accounting results will serve both as a tool for organizations to fulfill their responsibility for accountability to stakeholders and simultaneously, as a means for proper evaluation of environmental conservation activities.

Sustainable development is a principle of meeting needs now without sacrificing meeting the needs of future generations (Papaspyropoulos et al., 2016; Riduwan & Andajani, 2019).The development paradigm which is an indicator of the success of sustainable development was previously agreed upon through the Millennium Development Goals (MDGs). However, the MDGs ended in 2015. The new agreement for sustainable development, namely the 2030 agenda, produced the Sustainable Development Goals (SDGs) as a successor. The success indicators for this program are included in 17 goals and 169 targets (Beyne, 2020; Marrone et al., 2020). In supporting the achievement of the SDGs program in the environmental development pillar, there is one method in management accounting that can provide transparency in the management of material and energy use, this method is Material Flow Cost Accounting (MFCA) (Afifah, 2021; Loen, 2019; Marota, 2017; Marota et al., 2015).

Material Flow Cost Accounting related to product and material losses that are useful for improving the current accounting approach at two levels, namely the economic and environmental levels(Loen, 2019).Material Flow Cost Accounting (MFCA) is an effective tool to help organizations understand the potential environmental and economic impacts associated with the use of materials and labor(Marota, 2017).Factory process improvement concepts typically focus on reducing lead times, waste, or useless materials, and other aspects that drive increased production line productivity. An assessment of monetary investments or structural costs is usually not included, making it difficult for management personnel to understand the results of the improvements. Material Flow Cost Accounting is also an instrument that can be used to identify inefficiencies and their financial consequences, so that progress in resource efficiency is achieved. Several studies show that MFCA has a positive and significant effect on sustainable development and company sustainability(Loen, 2019; Marota, 2017).

Indonesia is the largest palm oil producing country in the world, followed by Malaysia (Selpiyanti & Fakhroni, 2020). Thousands of hectares of existing land are often converted into oil palm forests. The Central Statistics Agency (BPS) said that exports of crude palm oil (CPO) reached 2.16 million tons in July 2022, an increase compared to the position in June 2022 which

was only 1.76 million tons. The national palm oil industry is considered to contribute to helping the government create new jobs. Through the palm oil industry, the government also continues to be committed to supporting the biodiesel (B30) program as an alternative fuel oil to reduce dependence on fossil fuels. Oil palm plantations are spread across 190 districts in Indonesia and have had a positive impact on the economy of central areas. Palm oil is the most productive commodity contributing 42% of the world's total supply of vegetable oil, growth in world demand for vegetable oil increases by 8.5 million metric tons every year (Hidayat et al., 2018).

However, being the largest palm oil exporting country means that people have to lose a lot of what they have(Irawan & Soesilo, 2021). This change in the forest landscape (deforestation) to large-scale monoculture oil palm plantations causes the forest's function as a water regulator to be lost. As a result, floods and landslides occur more frequently when the intensity of rain begins to increase(Hidayat et al., 2018). During the dry season, clean water crises also occur everywhere, and forest and land fires continue to occur every year. The impact of large-scale land clearing for oil palm also causes losses to the ecosystem (Sukma Aisya, 2019).The Center for Science in the Public Interest (CSPI) once published a journal about the dangers posed by massive clearing of oil palm land. Most animals cannot survive in oil palm forests, which are described in the CSPI journal as biological deserts. Once oil palms are planted, these trees automatically replace hundreds of types of trees, vines, shrubs, mosses and other plants that are usually found in every hectare of lowland rainforest. As an industrial plantation crop, oil palm is planted in monoculture, so it is difficult for other plants to grow around it.

Planting oil palm trees also has an impact on pollution of the surrounding water and soil(Hidayat et al., 2018). This is caused by excessive use of pesticides. The palm oil industry uses approximately 25 different herbicides, insecticides, and other pesticides, causing contamination of crops, soil, and groundwater(Irawan & Soesilo, 2021). One of the most commonly used chemicals is the toxic herbicide paraquat dichloride. Many workers reportedly showed acute symptoms of paraquat poisoning, including nosebleeds, irritated eyes, nail loss, and stomach ulceration. In the journal(Irawan & Soesilo, 2021)It was also stated that most of the palm oil industry players cleared new land by burning. And in that process uses chemicals. This causes air pollution. Clearing land for oil palm also causes topsoil to erode and increases sedimentation in waterways. Erosion and sedimentation also increase if no rainforest buffer zones remain along river and stream banks and lake shores, as humus is carried by rain directly into the water.

It is hoped that the MFCA concept can become a new idea to support the achievement of the SDGs program, especially in the environmental sector. This research aims to examine the influence of the implementation of green accounting and material flow cost accounting on the sustainable development of oil palm plantation companies in Indonesia. It is hoped that this research will be useful for manufacturing companies in general in improving company sustainability, especially in reducing waste and inefficient use of raw materials and energy by implementing green accounting and material flow cost accounting and making it a reference in developing environmental management research in the future.

LITERATURE REVIEW

Stakeholder Theory

Stakeholder theory was first introduced by R. Edward Freeman in 1984. This theory states that running a business is not only in the interests of certain individuals, but must also provide benefits for stakeholders. Therefore, the existence of a company is influenced by the support and involvement of its stakeholders.

Application of green accounting (gree*n accounting*) is related to stakeholders, stakeholder theory means that it aims to create added value, where value added is support for the company by stakeholders (Mahsina & Agustia, 2023). Stakeholder theory is a theory which states that a company is not an entity that works or operates in its own interests, but is also beneficial to its

stakeholders(Astuti et al., 2022).According to (Gocejna, 2016), stakeholder theory describes that achievement The prosperity and success of a company is very dependent on the company's ability to adapt to the various interests of its customers *stakeholders* company.

Stakeholder theory also serves as a basis for analysis of groups in which companies must be responsible. Companies that can establish good cooperation and relationships with stakeholders, pay attention to the resulting environment and pay attention to record keeping will be able to improve the company's financial performance, because it will cause investors to invest in the company. This theory Also suggest that disclosure be made to meet stakeholder needs interests, because the company needs it stakeholder support for survive(Danso et al., 2019). Companies that process natural resources, or whose activities affect the environment, need to pay more attention to the communities and environments where they process and/or are affected by their activities(Nugroho & Elviandri, 2018).Stakeholder theory is a system that is explicitly based on the views of the company and the social environment, where both are a dynamic unity (Holder and Freeman, 1984). This means that stakeholders are influenced and influence the company and the relationship between the two is mutually dependent and connected with responsibility and accountability(Lu & Abeysekera, 2017). Thus, the existence of a company is greatly influenced by the support provided by stakeholders to the company. This theory is needed to explain green accounting variables andsustainable development. A sustainability report is a report that contains information about all company activities, and stakeholders (investors) have the right to have all the information they need for decision making.

Green Accounting

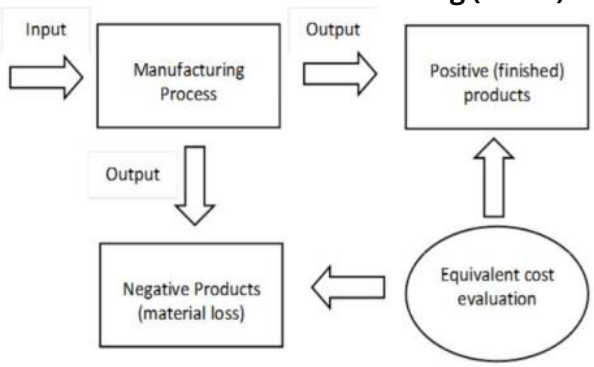
Green accounting is accounting which identifies, measures, assesses and discloses costs related to company activities related to the environment. Companies that implement environmental accounting can increase their competitive advantage over environmentally friendly processes, goods and services and, most importantly, increase their positive brand image among the public.(Benson et al., 2021).Improved environmental performance is a potential source of competitive advantage that can lead to more efficient processes(Dita & Ervina, 2021).Integrating environmental accounting into a company's accounting system is critical to evaluating productivity improvements, lowering compliance costs, and opening new market opportunities (Magablih, 2017).An organized environmental accounting system also helps management make more informed decisions. The objectives of developing environmental accounting include: a) Using environmental accounting as a management tool to evaluate the effectiveness of conservation activities by summarizing and classifying related costs. And b) Using environmental accounting as a communication tool with the community to convey negative environmental impacts, environmental conservation activities and the results to the public(Ashari & Anggoro, 2020).The benefits that companies get from implementing environmental accounting include: Saving expenses, Helping in decision making, Improving economic performance and the business environment, Satisfying all related parties, and Providing a competitive advantage for the business/activity(Rounaghi, 2019).It is hoped that the existence of environmental accounting can reduce the negative impact of company business activities on the environment.

Material Flow Cost Accounting (MFCA)

MFCA is one of the main tools of environmental management accounting (EMA). EMA is a set of procedures used in companies to link environmental considerations with economic objectives. MFCA was developed in Germany in the late 1990s and has since been widely adopted in Japan. The MFCA process can help improve a company's economic and environmental performance. The basis of Material Flow Cost Accounting (MFCA) is to look for ways to reduce costs by reducing waste, which is expected to increase business productivity. The advantages of using the MFCA model include increasing profits and productivity (internal) and

reducing negative impacts on the environment (external), which in turn contributes to the development of corporate sustainable development. The MFCA recognizes that wastes are material losses from factory processes and therefore they are part of the cost of production. Reducing the amounts of materials and waste, lowering production costs and increasing productivity. This leads to increased competitiveness, improved environmental friendliness and better manufacturing processes.

Figure 1. Material Flow Cost Accounting (MCFA) Works



Information:

1. MFCA tracks all raw materials used in the production process and measures the output in the form of finished products and waste produced.
2. Finished products and waste in the context of the MFCA are referred to as 'positive' and 'negative' products respectively.
3. The point is to identify waste as a secondary 'product' that cannot be sold when raw materials are consumed and manufacturing facilities are used.
4. The MFCA recognizes that wastes are material losses from factory processes and therefore they are part of the cost of production.
5. Reducing the amounts of materials and waste, lowering production costs and increasing productivity.
6. This leads to increased competitiveness, improved environmental friendliness and better manufacturing processes (Marota, 2017).

In this way, material losses are evaluated as economic losses which encourage management to look for ways to reduce waste and increase operational efficiency (Azlaila et al., 2022).

Sustainable Development

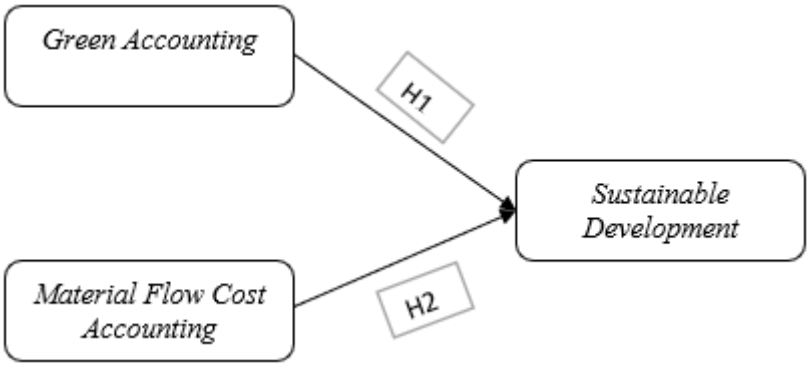
Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of the Corporate Sustainability Management System (CSMS) includes four indicators, namely economic, technological, social and environmental. These indicators are used to assess and evaluate performance in relation to sustainable development. Especially progress or setbacks in aspects of sustainable development such as economic, social and environmental. Apart from that, it can also provide information for policy makers to determine strategies and communicate results to stakeholders.

The initial emergence of the concept of sustainable development was triggered by concerns about the environment, especially regarding non-renewable natural resources which continue to be exploited. The main problem in economic development is how to handle the trade-off between meeting development needs and efforts to preserve the environment. Economic development that depends on natural resources without paying attention to

environmental sustainability will ultimately have a negative impact on the environment itself, because natural resources and the environment have a limited carrying capacity.

In essence, economic development that does not pay attention to the capacity of natural resources and the environment will cause problems in future development. The concept of not reducing and sacrificing the needs of future generations means carrying out current development without destroying the environment, without wasting Natural Resources (SDA), while still considering the interests of future generations. Future generations also need to be given the opportunity to actively participate in developing their creative ideas for managing and improving nature and development.

Figure 1. Research models



Green Accounting towards Sustainable Development

Green accounting generally implemented by companies that have attention and interest in environmental sustainability, sustainability, environmental effectiveness (eco effectiveness), environmental efficiency (ecoefficiency), and applying them directly with many marketing tools in strategic management(Agustia et al., 2019). Activities in green accounting consist of: collecting, analyzing, estimating and preparing reports on both environmental and financial data with the aim of reducing environmental impacts and costs(Lusiana et al., 2021). This form of accounting focuses on several aspects of government policy as best as possible. Consequently, environmental accounting has become an important aspect in the green business concept and responsible economic development(Tang et al., 2018). By implementing green accounting, it is hoped that the environment will be preserved, because in implementing green accounting the company will also voluntarily comply with government policies where the company runs its business.(Ma & Ma, 2019).

Activities carried out by companies related to the implementation of green accounting, for example planting trees, so that the costs incurred as a result of these activities for the company are expenses that must be financed by the company, where these expenses must be reported in the company's financial statements.(Maharani & Handayani, 2021).Moreover, seeing the long-term orientation towards the environment of each company emphasizes that tree planting activities also function as a means of environmental education for children, who are the next generation. (Brandl & Zielinska, 2020).Thus, the environmental impact is expected to continue into the future, when these children grow up and take on leadership roles in the future economy.(Voland et al., 2022).Therefore, financing issued by companies for environmental conservation and environmental health activities will support improving the quality of the surrounding environment, such as reducing carbon emissions, creating a healthy and green environment, promoting fruit consumption, preventing erosion, maintaining the function of water catchment areas, developing products. nature, as well as providing environmental education for the community and children (Agustia et al., 2019; Nurdiawansyah et al., 2018;

Sulich et al., 2021).So, based on the description above, the development of the hypothesis is structured as follows.

- H1: Green Accounting has a positive effect on Sustainable Development

Material Flow Cost Accounting towards Sustainable Development

Based on stakeholder theory, a company is not an entity that only operates for its own interests, but the company must provide benefits to stakeholders(Astuti et al., 2022).As the productivity of the garment industry increases, the volume of liquid waste produced by the textile industry will increase, which has the potential to contribute to environmental pollution, especially river pollution around the company's factory location. (Marota, 2017).As a result, to match stakeholder theory, companies must improve their bad image regarding environmental impacts by implementing management tools that support the management of waste from their activities. (Marota et al., 2015). One management instrument that can increase the use of materials effectively so as to reduce production waste is Material Flow Cost Accounting (MFCA)(Afifah, 2021). By implementing the MFCA, it will have a positive effect on corporate sustainability(Afifah, 2021; Marota, 2017; Marota et al., 2015).

This statement is supported by(Loen, 2019)which shows that MFCA has a positive effect on sustainable development with resource efficiency as a moderator. Several other findings also show that MFCA has a positive and significant effect on sustainable development (Marota, 2017; Marota et al., 2015; Rakesa et al., 2022). However, this is different from the results of other research which shows that MFCA (factory area) has no effect in increasing company sustainability with the moderating variable green accounting which has no effect on MFCA (production costs and factory area) in increasing company sustainability.(Abdullah & Amiruddin, 2017).So that, based on the description above, the development of the hypothesis is structured as follows.

- H2: *Material Flow Cost Accounting*(MFCA) has a positive effect on sustainable development

METHODS

The research carried out is a type of quantitative research, because it uses an approach that emphasizes the existence of variables as research objects and these variables must be defined in form operationalize each variable, so that it is easier to understand statistically(Jaya, 2020). The research implementation process uses research instruments, data collection and quantitative/statistical data analysis, with the aim of testing predetermined hypotheses (Sugiyono, 2018). The population in this research is all palm oil companies going public in Indonesia in 2018-2023.This research carried out sampling of the data obtained with the following research criteria:

1. Companies included in the list of palm oil company (CPO) issuers in Indonesia from 2018-2023
2. The palm oil company must be at least 10 years old as of 2018, so that the sample data used has longer achievements and experience in running this industry in Indonesia.
3. Palm oil companies that have research variable components in their (audited) financial reports from 2018-2023.

The data used in this research is classified as secondary data which is a number of data obtained from the Indonesian Stock Exchange website or the banking company's website itself.(Jaya, 2020). Apart from that, the secondary data used in this research is also in the form of PE journals research, data and other scientific references originating from the internet.

Table 1.Research Measurement Indicators

No.	Variable	Indicator	Scale
1.	**Green Accounting,** is accounting which identifies, measures, assesses and discloses costs related to company activities related to the environment(Lusiana et al., 2021). $GR_j = \frac{\sum X_{ij}}{n_j} x\ 100\%$ Information: GRj = Green Accounting for company j. Nj = Number of items for company j. Xij = dummy variable: 1 = if item i is disclosed; 0 = if item i is not disclosed and supported by social and economic aspects.	Green accounting measured using the environmental disclosure index number method. The environmental disclosure index uses the GRI 102 index (2018) with 33 disclosure items from 56 disclosure components, namely: 102-1 Name of Organization 102-2 Activities, brands, products and services 102-3 Location of head office Location of operations 102-4 Locations of operations: Information about the locations where the company operates. 102-5 Ownership and legal form: Details regarding company ownership and legal form. 102-6 Markets served: Specific segments or markets served by the company. 102-7 Organizational scale: The size or size of the company in terms of its structure and operations. 102-8 Information about employees and other workers: Data relating to the number and characteristics of employees and other workers. 102-9 Supply chain: Details about a company's supply chain, including suppliers and distributors. 102-10 Significant changes to the organization and its supply chain: Major changes that occurred in the company's organization and supply chain. 102-11 Prevention Principles or approaches: Approaches or principles used to prevent problems or risks. 102-12 External initiatives: External projects or programs supported or undertaken by the company. 102-13 Association Membership: A company's membership in a particular association or organization. 102-14 Statements from senior decision makers: Statements or commitments from company leaders. 102-15 Key impacts, risks, and opportunities: Analysis of the key impacts facing the company, possible risks, and existing opportunities. 102-16 Values, principles, standards, and norms of behavior: The values, principles, standards, and norms that guide corporate behavior. 102-17 Mechanisms for seeking advice and raising ethical concerns: The process or mechanism used to seek advice and raise ethical concerns. 102-18 Governance structure: The composition or structure of supervisory and decision-making bodies. 102-19 Delegation of authority: The method or process of transferring authority within a company. 102-20 Executive-level responsibilities for economic, environmental, and social topics: Responsibilities	Intervals

		assigned to executives related to economic, environmental, and social topics. 102-21 Consulting with stakeholders on economic, environmental and social topics: The process of consulting with stakeholders on economic, environmental and social topics. 102-22 Composition of the highest governance body and its committees: Information about the members and committees of the highest governance body. 102-23 Chair of the highest governance body: The identity or role of the chair of the highest governance body. 102-24 Nominating and electing the highest governance body: Process for nominating and selecting members of the highest governance body. 102-25 Conflict of interest: Procedures for handling conflicts of interest within the company. 102-26 The role of the highest governance body in setting goals, values and strategy: The role of the highest governance body in setting the direction of the company. 102-27 Collective knowledge of the highest governance body: The collective knowledge and expertise possessed by members of the highest governance body. 102-28 Evaluating the performance of the highest governance body: The process of evaluating the performance of the highest governance body. 102-29 Identifying and managing economic, environmental and social impacts: Steps to recognize and manage impacts from economic, environmental and social aspects. 102-30 Effectiveness of risk management processes: Evaluation of the effectiveness of the company's risk management processes. 102-31 Review of economic, environmental and social topics: Review or analysis of economic, environmental and social topics. 102-32 The role of the highest governance body in sustainability reporting: The role of the highest governance body in the process of reporting on corporate sustainability. 102-33 Communicating critical matters: A way or process for communicating critical issues facing a company. 102-34 Nature and total number of critical issues: Characteristics and number of critical issues identified in the company. 102-35 Remuneration policy: Policy or strategy related to employee remuneration. 102-36 Process for determining remuneration: The	

		process or method for determining employee compensation. 102-37 Involvement of stakeholders in remuneration: Consultation or involvement of stakeholders in the remuneration process. 102-38 Annual total compensation ratio: A comparison of the highest annual total compensation to the median or average within the company. 102-39 Percentage increase in annual total compensation ratio: Percentage increase in annual total compensation ratio from year to year. 102-40 List of stakeholder groups: A description or list of groups considered to be company stakeholders. 102-41 Collective bargaining agreement: An agreement or agreement relating to collective bargaining between a company and a labor union. 102-42 Identifying and selecting stakeholders: The process for identifying and selecting relevant stakeholders. 102-43 Approaches to stakeholder engagement: Approaches or strategies used in engaging stakeholders. 102-44 Key topics and issues raised: Key topics or issues raised in the stakeholder engagement process. 102-45 Entities included in consolidated financial statements: Entities or companies included in consolidated financial statements. 102-46 Establish report content and topic boundaries: The process for establishing report content and the topics covered. 102-47 List of material topics: A list or explanation of topics that are considered material in the company context. 102-48 Restatement of information: Arrangement or restatement of information contained in a report. 102-49 Changes in reporting: Changes or revisions in the reporting process carried out by the company. 102-50 Reporting period: The time period or periods during which the report is prepared or published. 102-51 New report date: The official date or deadline for publication of the report. 102-52 Reporting cycle: The process or cycle followed in preparing a report. 102-53 Point of contact for questions regarding reporting: Information or contact provided for questions related to reporting. 102-54 Claim that reporting complies with GRI Standards: A statement or claim that reporting complies with GRI Standards. 102-55 GRI content index: A list or index that shows the location of each element required in the GRI	

		Standards. 102-56 Assurance by external parties: Guarantee or guarantee from external parties regarding the accuracy or reliability of company reports	
2	**Material Flow Cost Accounting,**is a management tool with the aim that the costs of losses resulting from the production of materials can be evaluated and then a decision can be made that helps the company to treat themthe waste(Marota, 2017)	$\mathbf{MFCA = \frac{Total\ Ouput\ yang\ dihasilkan}{Total\ Biaya}}$	Intervals
3	**Sustainable Development is** development that meets the living needs of the present by taking into account meeting the living needs of future generations.	This measurement refers to research previously (Marota, 2017) that is: ***Sustainable development*= Economic + Social + Environmental + Technological** *a)* The economic dimension in the annual report looks at investment, net profit and sales. b) The social dimension of the annual report can be seen in the costs incurred to pay salaries and costs to pay severance pay. c) The environmental dimension is shown in utility costs (costs arising from the use of facilities and infrastructure for company production such as electricity costs and PDAM costs) and K3 costs. d) In the technological dimension, we look at Research and Development Costs (costs incurred as a result of companies carrying out research and development of palm oil quality)	Intervals

The data analysis method used is the multiple linear regression method which goes through several previous test stages, such as descriptive statistical tests used to describe the variables in the research (Jaya, 2020). Uji classic assumptions to detect whether there are deviations from the classical assumptions used in the multiple regression equation. This test generally includes a normality test to check whether the residuals are normally distributed, as well as a multicollinearity test to assess the level of association between independent variables. The analysis technique used in this research uses multiple linear regression analysis. Researchers use testing tools, namely IBM SPSS statistics, to test the relationship between the independent variable and the dependent variable. In this analysis test, the model form is used, as follows.

$$\mathbf{Y1 = \beta0 + \beta1X1 + \beta2X2 + \varepsilon}$$

Information:

Y =Sustainable development
X1 = Green accounting
X2 =*Material Flow Cost Accounting*
β0 = Constant(regression coefficient)
ε =*Error*

RESULTS

Table 2.Descriptive Statistics Test Results

	N	Minimum	Maximum	Mean	Std. Deviation
MFCA	96	1.1175	3.0204	2.193352	.4599281
GA	96	.1925	2.9619	1.494782	.7210740
elementary school	96	1.6769	2.1969	1.949087	.1518705
Valid N (listwise)	96				

Source: IBM SPSS output, 2024.

The Material Flow Cost Accounting (MFCA) variable shows an average value of 2.193. The smallest MFCA value is 1.11. Meanwhile, the largest MFCA value is 3.02. The MFCA standard deviation value shows a value of 0.459, which is smaller than the average. This result means that the distribution of Material Flow Cost Accounting (MFCA) data is even. The green accounting (GA) variable shows an average value of 1.494. The smallest GA value is 0.1925. Meanwhile, the largest GA value is 2.961. The standard deviation value of green accounting (GA) shows a value of 0.721, which is smaller than the average. This result means that the distribution of green accounting data is even. The Sustainable development (SD) variable shows an average value of 1.949. The smallest sustainable development value is 1.676. Meanwhile, the largest sustainable development value was 2.196. The standard deviation value of sustainable development shows a value of 0.151, which is smaller than the average. This result means that the distribution of sustainable development data is even.

Table 3. Model Normality Test Results

		Unstandardized Predicted Value
N		96
Normal Parameters, b	Mean	1.9490875
	Std. Deviation	.13948260
Most Extreme Differences	Absolute	,059
	Positive	,059
	Negative	-.059
Kolmogorov-Smirnov Z		,583
Asymp. Sig. (2-tailed)		,886

a. Test distribution is Normal.
b. Calculated from data.
Source: IBM SPSS output results, 2024.

From table 3 above, you can see the significance value or Asymp. Sig. (2-tailed) of 0.886 which indicates that the significant value is > 0.05. Thus, the residual values of all research variables in model equation 1 are normally distributed.

Table 4. Model Multicollinearity Test Results

Model		Unstandardized Coefficients		Standardized Coefficients	Collinearity Statistics	
		B	Std. Error	Beta	Tolerance	VIF
1	(Constant)	1,349	,032			
	GA	,058	.012	,275	,542	1,844
	MFCA	,234	.018	,710	,542	1,844

a. Dependent Variable: SD
Source: IBM SPSS output results, 2024.

Based on table 4 above, it can be seen that the multicollinearity test results show a tolerance value above 0.1 and a Variance Inflation Factor (VIF) value below 10 for each variable. From the results of the multicollinearity test in model 1, it can be concluded that all independent variables in this regression model have no correlation between one variable and another.

Table 5. Model Feasibility Test Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1,848	2	,924	250,655	,000b
	Residual	,343	93	,004		
	Total	2,191	95			

a. Dependent Variable: SD
b. Predictors: (Constant), MFCA, GA
Source: IBM SPSS output, 2024.

Based on table 5, the significant value is <0.05, so it means that the regression equation model for this research is fit and suitable for use in resolving the hypothesis of this research.

Table 6. t Test Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1,349	,032		42,303	,000
GA	,058	.012	,275	4,942	,000
MFCA	,234	.018	,710	12,739	,000

a. Dependent Variable: SD
Source: IBM SPSS output, 2024.

Hypothesis testing regarding the influence of green accounting on sustainable development of palm oil plantation companies or the first hypothesis of this research shows that the t value of this variable is 4.942 with a significance level of 0.000 or <0.05. This result means that the first hypothesis is accepted. This means that for every one unit increase in Green Accounting, sustainable development will increase by 0.058 units assuming other variables remain constant. These findings support researchpreviously,where green accounting has a positive and significant effect on sustainable development (Ma & Ma, 2019).By implementing green accounting, it is hoped that the environment will be preserved, because in implementing green accounting the company will also voluntarily comply with government policies where the company runs its business. Green accounting through environmental accounting is an important aspect of the green business concept and responsible economic development (Tang et al., 2018).

Hypothesis testing regarding the influence of material flow cost accounting (MFCA) on sustainable development of palm oil plantation companies or the second hypothesis of this research shows that the t value of this variable is 12.739 with a significance level of 0.000 or <0.05. This result means that the second hypothesis is accepted. This means that for every one unit increase in material flow cost accounting (MFCA), sustainable development will increase by 0.234 units assuming other variables remain constant. These findings support researchwhere before, MFCA has a positive and significant effect on sustainable development (Marota, 2017; Marota et al., 2015; Rakesa et al., 2022). Another statement said that One management instrument that can increase the use of materials effectively so as to reduce production waste is Material Flow Cost Accounting (MFCA) (Afifah, 2021). By implementing the MFCA, it will have a positive effect on corporate sustainability (Afifah, 2021; Marota, 2017; Marota et al., 2015).

Table 7. Coefficient of determination test results (R2)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.918a	,844	,840	.0607195

a. Predictors: (Constant), MFCA, GA
b. Dependent Variable: SD
Source: Data Processing Results, 2023.

The SPSS output results in table 7 above show that the Adjusted R Square value is 0.840 or 84.0%, which is the percentage influence of the green accounting and Material Flow Cost Accounting (MFCA) variables in influencing sustainable development. Meanwhile, the remaining 16.0% shows that there are still other factors that may have an influence on environmental performance which were not examined in this research.

DISCUSSION

Green Accounting influence on the sustainable development of palm oil plantation companies in Indonesia. Green Accounting is a part of environmental accounting that combines environmental benefits and costs into decision making. The test results from this research prove that The implementation of environmental accounting for business people can also trigger positive developments and improve the company's image in society, so that it can maintain its business's sustainable development capabilities in the eyes of investors (Sapulette et al., 2021). Companies that implement environmental accounting can provide more satisfaction for employees, so that company performance will increase in the form of productivity and innovation which has an impact on the sustainability of its business.(Lusiana et al., 2021). In fact, the greater the disclosure of environmental accounting, the more investors will increase capital investment, so that hopes for sustainable development will increase(Andi et al., 2020).

Of course, this finding makes prove that Environmental accounting (green accounting) is needed to process environmental costs. Green Accounting is a concept where companies in their production processes prioritize efficiency and effectiveness in the use of resources in a sustainable manner so that they are able to align company development with environmental functions and can provide benefits to society. Therefore, the accounting department also plays a role and commitment to the environment through voluntary disclosure of costs environment in a company's financial statements for a better future of natural resources (*sustainable development*).

Material flow cost accounting (MFCA) influence on the sustainable development of palm oil plantation companies in Indonesia. Contemporary management accounting has developed Material Flow Cost Accounting (MFCA) as a tool for measuring and calculating financial and non-financial waste, with the aim of supporting managerial decision making in reducing waste. MFCA was first developed in Germany and has undergone various developments and improvements in its application in Japan in recent years. MFCA is a unique management technique that can significantly reduce costs and improve quality by helping organizations understand the environmental and financial impacts of materials and energy practices and work to improve them through changes in operational practices.

Material Flow Cost Accounting (MFCA) is the main tool in environmental accounting management that increases transparency in raw material use practices by developing raw material flow models. This model allows tracking and calculating the flow and stock of raw materials physically and in monetary terms within the organization. MFCA can be applied to various types of industries that use raw materials and energy, regardless of the type and scale of the industry, and whether they have an environmental management system or not. These findings support previous research, where MFCA with the variables production costs, area,

production results has an effect on the sustainability of a company (Loen, 2019; Marota, 2017). The advantage of using the MFCA model is that it can increase profits and productivity (internal) as well as reducing negative impacts on the environment (external) which in turn contributes to the development of corporate sustainability (corporate sustainable development).

CONCLUSION

This research found that green accounting and material flow cost accounting (MFCA) have a positive and significant effect on the sustainable development of palm oil plantation companies in Indonesia. Companies that have implemented green accounting in their good financial reporting will provide public trust, so that the company can operate continuously (sustainable development). This also proves that the harmony of company development with environmental functions can also contribute to company sustainability. The five elements for corporate organizations in developing a sustainable environment are economic sustainability, social indicators, environmental analysis, independently selected sustainability indicators and the materials and resources used. Therefore, stakeholders should encourage companies not only to be responsible for profitability, but also to start demanding companies to protect the environment and improve social life.

To fulfill stakeholder theory, companies must improve their image as companies that care about the environment by implementing management tools that help in managing waste resulting from company activities. One management tool that is effective in increasing the efficiency of material use and reducing production waste is Material Flow Cost Accounting (MFCA). Material flow cost accounting can reduce negative products (waste) and increase profits, because the application of material flow cost accounting makes the production process more transparent and measurable (Loen, 2019). Thus, the results of this research state that the greater the value of material flow cost accounting, the greater the sustainable development of plantation companies in Indonesia.

There are several limitations to this research which may influence the research results. These limitations, namely the limited number of companies operating only in the oil palm plantation industry in Indonesia. Apart from that, the variables used are still lacking. Subsequent authors can use moderating or intervening variables. Apart from that, the measurement of the green accounting variable is still subjective, so future authors are expected to use other measurements.

SUGGESTION

Based on the results of this research, suggestions for future research are the need for several indicators to assess and evaluate performance in relation to sustainable development which shows the trend of progress or setbacks in aspects of sustainable development such as economic, social and environmental. can also provide information for policy makers to determine strategies and communicate results to stakeholders. For further research, it is hoped that we can observe other variables and further develop research on MFCA because there is still a lack of research related to MFCA with other variables.

REFERENCES

Abdullah, MW, & Amiruddin, H. (2017). The Effect of Green Accounting on Material Flow Cost Accounting in Improving Company Sustainability. Equity: Journal of Economics And Finance, 32, 166–186. https://doi.org/10.24034/j25485024.y2020.v4.i2.4145

Afifah, D. (2021). Achieving the Sustainable Development Goals Target with the Material Flow Cost Accounting Concept. MAXIMUM: Accounting Media Muhammadiyah University Semarang, 11(1).

Agustia, D., Sawarjuwono, T., & Dianawati, W. (2019). The Mediating Effect of Environmental Management Accounting on Green Innovation - Firm Value Relationship. 9(2), 299–306.

Andi, A., Lolo, KP, Habbe, H., & Andi, MK (2020). Green Accounting and Its Implementation in Indonesia. Effector, 7(1), 59-72.

Ashari, MH, & Anggoro, Y. (2020). Implementation of Green Accounting in Business Sustainability at Public Hospitals in Malang Raya. International Journal of Multicultural and Multireligious Understanding, 7(10), 391. https://doi.org/10.18415/ijmmu.v7i10.2102

Astuti, T., Amyulianthy, R., & Kaniati, R. (2022). Green Accounting, Financial Performance toward Firm Value. Asian Journal of Accounting and Finance, 4(1), 1–12. https://doi.org/10.55057/ajafin.2022.4.1.1

Azlaila, T., Khotimah, N., Ekawati, E., & Sisdianto, E. (2022). The Effect of Green Accounting and Material Flow Cost Accounting on Corporate Sustainability in Islamic Economic Perspective: Study on Manufacturing Companies Listed on the Sri-Kehati Index 2016-2020. Annual International Conference on Islamic Economics and Business, 2(1), 233–243.

Benson, N.C., Akabom Ita, A., Ethel Oonly, I., & A. Adesola, F. (2021). Effect Of Green Accounting On Financial Performance Of Oil And Gas Companies In Nigeria. Journal of the University of Shanghai for Science and Technology, 23(12), 166–190. https://doi.org/10.51201/justst/21/11974

Beyne, J. (2020). Designing and implementing sustainability: An integrative framework for implementing the sustainable development goals. European Journal of Sustainable Development, 9(3), 1–12. https://doi.org/10.14207/ejsd.2020.v9n3p1

Brandl, J., & Zielinska, I. (2020). Reviewing the smart city Vienna framework strategy's potential as an eco-social policy in the context of quality of work and socio-ecological transformation. Sustainability (Switzerland), 12(3), 1–17. https://doi.org/10.3390/su12030859

Danso, A., Adomako, S., Amankwah-Amoah, J., Owusu-Agyei, S., & Konadu, R. (2019). Environmental sustainability orientation, competitive strategy and financial performance. Business Strategy and the Environment, 28(5), 885–895. https://doi.org/10.1002/bse.2291

Dita, EMA, & Ervina, D. (2021). The Influence of Green Accounting, Environmental Performance and Company Size on Financial Performance (Case Study of Mining Sector Companies Listed on the Indonesian Stock Exchange in 2017-2018). JFAS : Journal of Finance and Accounting Studies, 3(2), 72–84. https://doi.org/10.33752/jfas.v3i2.272

Dura, J., & Suharsono, RS (2022). Application Green Accounting To Sustainable Development Improve Financial Performance Study In Green Industry. Journal of Accounting, XXVI(02), 192–212.

Gocejna, M. M. (2016). The Relationship Between Corporate Social Responsibility and Corporate Financial Performance – Evidence From Empirical Studies. Comparative Economic Research, 19(4), 67–84.

Hellmeister, A., & Richins, H. (2019). Green to gold: Beneficial impacts of sustainability certification and practice on tour enterprise performance. Sustainability (Switzerland), 11(3), 1–17. https://doi.org/10.3390/su11030709.

Holder, A. A., & Freeman, R. R. (1984). Protective antigens of rodent and human blood stage malaria. Philosophical Transactions of the Royal Society of London. B, Biological Sciences, 307(1131), 171-177.

Hidayat, NK, Offermans, A., & Glasbergen, P. (2018). Sustainable palm oil as a public responsibility? On the governance capacity of Indonesian Standard for Sustainable Palm Oil (ISPO). Agriculture and Human Values, 35(1), 223–242. https://doi.org/10.1007/s10460-017-9816-6

Irawan, B., & Soesilo, NI (2021). Impact of Downstream Palm Oil Industry Policy on CPO Demand in Downstream Industries. Journal of Economics and Public Policy, 12(1), 29–43. https://doi.org/10.22212/jekp.v12i1.2023

Jaya, IMLM (2020). Quantitative and Qualitative Research Methods: Theory, Application and Real Research (V. Wiratna Sujarweni (ed.); 1st ed.). http://www.anakhebatindonesia.com/author-i-made-laut-mertha-jaya-606.html. http://www.anakhebatindonesia.com/author-i-made-laut-mertha-jaya-606.html

Loen, M. (2019). The Influence of Implementing Green Accounting and Material Flow Cost Accounting on Sustainable Development with Resource Efficiency as a Moderation. Krisnadwipayana Accounting and Business Journal, 6(3), 14–25.

Lu, Y., & Abeysekera, I. (2017). What Do Stakeholders Care About? Investigating Corporate Social and Environmental Disclosure in China. Journal of Business Ethics, 144(1), 169–184. https://doi.org/10.1007/s10551-015-2844-5

Lusiana, M., Hassan, M., Haat, C., Saputra, J., Yusliza, MY, Muhammad, Z., & Bon, AT (2021). A Review of Green Accounting, Corporate Social Responsibility Disclosure, Financial Performance and Firm Value Literature. 5622–5640.

Ma, J., & Ma, J. (2019). A Research Review of Corporate Green Accounting Information Disclosure. IOP Conference Series: Earth and Environmental Science, 310(5). https://doi.org/10.1088/1755-1315/310/5/052071

Magablih, AM (2017). The Impact of Green Accounting for Reducing the Environmental Cost in Production Companies. Journal of Modern Accounting and Auditing, 13(6), 249–265. https://doi.org/10.17265/1548-6583/2017.06.002

Maharani, P., & Handayani, S. (2021). The Influence of Green Accounting on Company Value in the Mining Sector. 5(1), 220–231.

Mahsina, & Agustia, D. (2023). Does green innovation play an important role in the effect board gender diversity has on firm performance? Intangible Capital, 19(2), 146–164. https://doi.org/10.3926/IC.2020

Marota, R. (2017). Green Concepts and Material Flow Cost Accounting Application for Company Sustainability. Indonesian Journal of Business and Entrepreneurship, 3(1), 43–51. https://doi.org/10.17358/ijbe.3.1.43

Marota, R., Marimin, & Sasongko, H. (2015). Design and Implementation of Material Flow Cost Accounting to Increase the Sustainability of the PT XYZ Company. Journal of Management & Agribusiness, 12(2), 92–105. https://doi.org/10.17358/JMA.12.2.92

Marrone, M., Linnenluecke, M. K., Richardson, G., & Smith, T. (2020). Trends in environmental accounting research within and outside of the accounting discipline. Accounting, Auditing and Accountability Journal, 33(8), 2167–2193. https://doi.org/10.1108/AAAJ-03-2020-4457

Masocha, R. (2019). Social sustainability practices on small businesses in developing economies: A case of South Africa. Sustainability (Switzerland), 11(12). https://doi.org/10.3390/SU11123257

Nugroho, SS, & Elviandri. (2018). Memayu Hayuning Bawana: Tracing the Spirituality of Transcendence in the Law of Natural Resource Management Based on Javanese Community Wisdom. Development and Law Enforcement in Indonesia, 1, 346–355.

Nurdiawansyah, Lindrianasari, & Komalasari, A. (2018). Carbon Emission Issues in Indonesia. Review of Integrative Business and Economics Research, 7(3), 20–33. http://repository.lppm.unila.ac.id/7178/1/RIBER 2018 %28a%29.pdf

Papaspyropoulos, K.G., Karamanolis, D., Sokos, C.K., & Birtsas, P.K. (2016). Enhancing Sustainability in Forestry Using Material Flow Cost Accounting. Open Journal of Forestry, 06(05), 324–336. https://doi.org/10.4236/ojf.2016.65026

Rakesa, RC, Nyoman, D., Werastuti, S., & Ekonomi, J. (2022). The Effect of Implementing Green Accounting and Material Flow Cost Accounting on Corporate Sustainability (Empirical

Study of Textile and Garment Companies Listed on the Indonesian Stock Exchange). JIMAT (Scientific Journal of Accounting Students), 13(1), 1141–1152.

Riduwan, A., & Andajani, A. (2019). Sustainability Concerns and Investor Responses to Earnings Announcements. Indonesian Journal of Sustainability Accounting and Management, 3(2), 187. https://doi.org/10.28992/ijsam.v3i2.96

Rounaghi, M. M. (2019). Economic analysis of using green accounting and environmental accounting to identify environmental costs and sustainability indicators. International Journal of Ethics and Systems, 35(4), 504–512. https://doi.org/10.1108/IJOES-03-2019-0056

Sapulette, S.G., & Limba, F.B. (2021). The influence of implementing green accounting and environmental performance on the value of manufacturing companies listed on the IDX in 2018-2020. Kupna Accounting: Collection of Accounting Articles, 2(1), 31-43.

Selpiyanti, & Fakhroni, Z. (2020). The Influence of Implementing Green Accounting and Material Flow Cost Accounting on Sustainable Development. JOURNAL OF ASSETS (ACCOUNTING RESEARCH), 12(1), 109–116.

Sugiyono. (2018). Quantitative, Qualitative, and R&D Research Methods. Alphabet.

Sukma Aisya, N. (2019). The Dilemma of Indonesia's Position in the Paris Agreement on Climate Change. Indonesian Perspective, 4(2), 118–132.

Sulich, A., Sołoducho-Pelc, L., & Ferasso, M. (2021). Management styles and decision-making: Pro-ecological strategy approach. Sustainability (Switzerland), 13(4), 1–18. https://doi.org/10.3390/su13041604

Tang, M., Walsh, G., Lerner, D., Fitza, M. A., & Li, Q. (2018). Green Innovation, Managerial Concern and Firm Performance: An Empirical Study. Business Strategy and the Environment, 27(1), 39–51. https://doi.org/10.1002/bse.1981

Trinugroho, I., Pamungkas, P., Wiwoho, J., Damayanti, SM, & Pramono, T. (2022). Adoption of digital technologies for micro and small business in Indonesia. Finance Research Letters, 45(March 2021), 102156. https://doi.org/10.1016/j.frl.2021.102156

Voland, N., Saad, M. M., & Eicker, U. (2022). Public Policy and Incentives for Socially Responsible New Business Models in Market-Driven Real Estate to Build Green Projects. Sustainability, 14(12), 7071. https://doi.org/10.3390/su14127071

Zhang, J., Liang, G., Feng, T., Yuan, C., & Jiang, W. (2020). Green innovation to respond to environmental regulation: How do external knowledge adoption and green absorptive capacity matter? Business Strategy and the Environment, 29(1), 39–53. https://doi.org/10.1002/bse.2349