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Implementation Effectsgreen Accounting, Material Flow Cost Accounting, And Environmental Performance To Sustainable Developmentin Companies On The Idx

(Study on the sector Basic Materials on the IDX 2021-2025)

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Abstract—

This study aims to test the influence of Green Accounting, Material Flow Cost Accounting (MFCA), and Environmental Performance to Sustainable Development. This quantitative research uses secondary data from annual reports, sustainability reports, and PROPER ratings. The sample was determined through purposive sampling as many as 67 sector companies Basic Materials on the IDX for the 2021–2025 period (335 observations). Data were analyzed using Robust Standard Errors in Stata 17. The F-test results show the overall suitability of the model in predicting Sustainable Development proven to be very good and significant ($F = 54.935$; $p = 0.000$). Partially (t-test), MFCA has a positive and significant effect (coefficient = 0.544; $p = 0.000$), while Green Accounting (coefficient = -0.136; $p = 0.252$) and Environmental Performance (coefficient = -0.012; $p = 0.532$) has no significant effect. The R-squared value of 0.357 indicates that the independent variable is able to explain 35.7% of the variation. Sustainable Development. This study concludes that material management efficiency through MFCA is a key driver of corporate sustainability.

Keywords— *Green Accounting, Material Flow Cost Accounting, Environmental Performance, Sustainable Development, Basic Materials, AT*

I. INTRODUCTION

Global economic development today is no longer only oriented towards profit growth, but is also starting to move towards the concept of sustainable development (sustainable development). A concept that balances economic, social, and environmental aspects. This concept has become a major global concern in recent years due to increasing environmental damage, climate change, and uncontrolled exploitation of natural resources. The implementation of sustainable development encourages companies to not only pursue profit but also consider the impact of operational activities on the environment and society (Setiawati & Sari, 2023).

The increasing attention to sustainability issues is also marked by the obligation to submit sustainability reports (sustainability report) for public companies. Through these reports, companies can disclose various information regarding their economic, social, and environmental performance over a specific period (Irma & Lestari, 2021). However, the level of sustainability disclosure between companies still shows differences. Some companies have disclosed comprehensive sustainability information in accordance with standards. Global Reporting Initiative (GRI), while others are still limited in presenting information related to environmental management, efficient use of resources, and corporate social contributions. This condition indicates that the implementation of Sustainable Development in the company sector Basic Materials still requires continuous attention and improvement (Diono & Prabowo, 2017).

In Indonesia, Hatta et al., (2026) stated that the issue of sustainable development (sustainable development) is becoming increasingly important along with the rapid development of the sector Basic Materials which serves as a primary supplier of raw materials for various industries, such as construction, manufacturing, chemicals, metals, and pulp and paper. This sector makes a significant contribution to the national economy, but on the other hand, its operational activities also have the potential to cause various environmental impacts, such as carbon emissions, environmental pollution, natural resource exploitation, and ecosystem degradation. Sector Characteristics Basic Materials which is closely related to the use of natural resources, requires companies in this sector to implement sustainability-oriented business practices in order to balance economic, social and environmental aspects.

This phenomenon is reinforced by various cases that have occurred in the sector Basic Materials in recent years. One phenomenon that shows the still low level of implementation of environmental responsibility in the sector Basic Materials. This incident occurred in the Morowali nickel processing industrial area, Central Sulawesi. In May 2025, the Minister of Environment conducted a direct inspection of the Indonesian region. Morowali Industrial Park (IMIP) and found various serious violations in environmental management. The inspection results showed the existence of practices open dumping at the Bahomakmur Final Disposal Site (TPA) which has the potential to pollute land and water, discharge of flood water from industrial areas into the sea without adequate waste processing, as well as waste management lag. And tailing Nickel production is considered to be under-monitored, potentially increasing the risk of heavy metal pollution. Furthermore, comprehensive monitoring of industrial emission sources has not been carried out. These findings indicate that some companies still lack adequate environmental management, despite the nickel industry's strategic role in supporting national economic growth. This situation indicates that companies in the mining sector are not implementing adequate environmental management. Basic Materials are required to pay more attention to sustainability aspects in carrying out their operational activities so that a balance between economic, social and environmental aspects can be achieved and support the realization of Sustainable Development (Itsaini & Alexander, 2024).

Implementation Sustainable Development in the company sector Basic Materials has become an increasingly important issue in recent years. This is due to the sector's highly dependent nature, which relies heavily on the use of natural resources and energy, potentially leading to various environmental impacts. In addition to the demand for economic profit, companies in the mining sector Basic Materials Companies are also expected to be able to carry out social responsibilities and maintain environmental sustainability as part of efforts to achieve sustainable development. Therefore, companies need to implement business strategies that are not only profit-oriented but also consider environmental aspects. people and the planet as the main elements of sustainability (Puspita et al., 2024).

Based on the dynamics of the phenomenon and the inconsistencies of the research, this study aims to test and analyze the influence Green Accounting, Material Flow Cost Accounting (MFCA), as well as Environmental Performance to Sustainable Development in the company sector Basic Materials listed on the Indonesia Stock Exchange (IDX). The results of this study are expected to provide theoretical and academic contributions to enrich the environmental accounting literature, as well as practical contributions as a reference for operational efficiency for company management, decision-making for investors, and regulatory evaluation material for the government, IDX, and OJK.

Legitimacy theory

Legitimacy theory explains that companies strive to gain and maintain public acceptance by carrying out activities in accordance with prevailing social values, norms, and expectations. Therefore, companies are encouraged to disclose social and environmental information as a form of accountability to the public (Permatasari & Setyastrini, 2019).

In the sector basic materials The issue of legitimacy is crucial because corporate operations are closely linked to the exploitation of natural resources, massive energy use, carbon emissions, production waste, and potential environmental pollution. Transparent disclosure of environmental information provides a means for companies to gain social legitimacy from the community, government, investors, and other stakeholders (Sugitan & Kapojos, 2026).

Sustainable Development

Definition expressed by Nur & Susilowati (2025) sustainable development is a crucial concept for ensuring business continuity for future generations. Meanwhile, Burhany & Nurniah (2013) state that sustainable development can be measured through economic, social, environmental, and technological aspects, with an emphasis on innovation that can have a positive impact on human welfare now and in the future and maintain balance with the environment.

This concept was first widely popularized by Brundtland Commission through reports *Our Common Future* (Loen, 2019). Sustainable development will be achieved when companies are able to integrate economic, social, environmental, and technological pillars in a balanced manner for both short-term and long-term sustainability. Sustainable development is a concept that emphasizes optimizing resource utilization while maintaining environmental and social aspects of society, both now and in the future.

In the corporate context, sustainable development not only focusing on achieving economic profit, but also paying attention to social responsibility and environmental preservation. This concept is known as the social approach. Triple Bottom Line which was introduced by Elkington, namely profit, people, And planet (Haryati, 2025).

In this study, Sustainable Development measured using Sustainability Disclosure Index (SDI). This measurement is carried out using the method content analysis to the annual report (annual report) and sustainability reports (sustainability report) company. The Sustainability Disclosure Index is used to measure the extent to which a company discloses information related to sustainability aspects, including economic, social, and environmental dimensions, as a form of the company's commitment to sustainable development (Ningsih & Rachmawati, 2017).

The SDI is measured by comparing the number of sustainability items disclosed by a company to the total number of disclosure items that should be disclosed based on the guidelines used. Each disclosure item is given a score of 1 if disclosed and a score of 0 if not disclosed. A higher index value indicates a greater extent of sustainability disclosure by the company, thus reflecting the level of implementation. sustainable development which is getting better.

Green Accounting

Bell, F., & Lehman (1999) define environmental accounting as a modern concept in the field of accounting that supports environmentally friendly movements within companies or organizations, through the process of recognizing, measuring, and disclosing environmental contributions in business activities.

Environmental accounting (green accounting) emphasizes the importance of corporate awareness to proactively minimize various environmental problems arising from the company's operational activities. Implementation green accounting become one of the company's efforts to support sustainable development (sustainable development) through better environmental impact management (Rahmatika & Wijaya, 2024)

Measurement Green Accounting The environmental cost approach uses the ratio of environmental costs to the company's net profit (Sugitan & Kapojos, 2026). This ratio is used to determine the proportion of the company's profits allocated to environmental management and protection activities (Yuninalita et al., 2025). A higher ratio indicates a greater company commitment to implementing environmental management. Green Accounting and corporate environmental responsibility.

The formula used to measure Green Accounting is as follows:

$$GA = \text{Environmental Cost} / \text{Net Profit}$$

Material Flow Cost Accounting (MFCA)

According to Panggabean et al., (2024) it is stated that Material Flow Cost Accounting (MFCA) is a management tool designed to help companies be more concerned with environmental management, increase competitiveness, and improve production processes. In its application, MFCA begins with measuring waste at each stage of the production process and analyzing potential cost efficiencies. Meanwhile, Vera et al., (2025) explained that MFCA is an environmental management accounting method that aims to reduce costs while reducing environmental impacts, with a primary focus on reducing waste to increase company efficiency and productivity.

MFCA acts as a management tool that supports operational efficiency and environmental sustainability by reducing waste in the production process (Panggabean et al., 2024, Alfian et al., 2020, Mufti, 2021, Vera et al., 2025). In this study, MFCA was measured using the natural logarithm (Ln) of production costs. The use of natural logarithms aims to reduce differences in data scale between companies, address the level of dispersion (missing) data that is too large, and produces a more normal data distribution, making it more suitable for statistical analysis. This approach refers to the

research of Putri et al. (2024), which uses production costs as a proxy in measuring the implementation of MFCA. Production costs are obtained from the sum of all cost components incurred in the production process, namely raw material costs, direct labor costs, and overhead costs. Next, the total production costs are transformed into the natural logarithm (Ln) form. The steps for calculating MFCA in this study according to Putri et al., (2024) using the natural logarithm (LN) of production costs obtained from:

$$\text{Production Cost} = \text{BBB} + \text{BTKL} + \text{BOP}$$

Information :

BBB	:	Raw Material Costs
BTKL	:	Direct Labor Costs
BOP	:	Cost Overhead Factory

In this study, data on raw material costs, direct labor costs, and overhead costs were collected. Overhead Factory costs were obtained from the company's financial statements. These three components were added together to obtain the total production cost, then transformed using the natural logarithm (Ln) before being analyzed in a regression model.

Environmental Performance

Kurnianingtyas & Trisnawati (2024) define environmental performance as a company's ability to create healthy environmental conditions, good environmental performance is considered capable of supporting the achievement of sustainable development. Meanwhile, Julianto & Sjarief (2019) define environmental performance as a reflection of a company's level of success in managing and controlling the environmental impacts arising from its operational activities. Environmental performance indicates the extent to which a company is able to carry out its environmental responsibilities through various efforts such as waste management, pollution control, efficient use of resources, and compliance with applicable environmental regulations.

In this study, environmental performance is measured using the results of the Corporate Performance Rating Program for Environmental Management (PROPER) assessment issued by the Ministry of Environment and Forestry (KLHK). PROPER was chosen because it is the official government instrument used to objectively and standardize the level of corporate environmental performance in Indonesia.

PROPER assesses a company's environmental performance based on its compliance and excellence in environmental management. The PROPER rating consists of five categories: Gold, Green, Blue, Red, and Black. In this study, these ratings were converted into numerical scores to facilitate data analysis: Gold = 5, Green = 4, Blue = 3, Red = 2, and Black = 1 (Santoso & Handoko, 2025).

PREVIOUS RESEARCH

Research conducted by Fazmi et al., (2024) with the title "Analysis of the Implementation of Green Accounting and Material Flow Cost Accounting towards Sustainable Development (Case Study at PT. Pupuk Iskandar Muda Aceh Utara Period 2018–2022)" aims to analyze the impact of implementing green accounting and material flow cost accounting to sustainable development. The independent variable in this study is green accounting (X1) and material flow cost accounting (X2), while the dependent variable is sustainable development (Y). This study uses a quantitative method with secondary data in the form of the annual report of PT. Pupuk Iskandar Muda for the period 2018–2022, and is analyzed using multiple linear regression with the help of IBM SPSS 26. The results of the study show that green accounting, which is measured through the PROPER indicator, does not have an effect on Sustainable Development, which indicates that environmental performance has not been able to improve the company's sustainability. On the other hand, material flow cost accounting has an impact on sustainable development, especially in the dimensions of production costs and production results, which means that the more efficient the management of costs and material flow, the more the company's sustainability will increase.

Research conducted by Dewi, (2025) entitled "Sustainable Development: Application of Green Accounting and Material Flow Cost Accounting (Case Study of Consumer Goods Companies) Non-Cyclical 2021–2023)" aims to analyze the influence of Green Accounting and Material Flow Cost Accounting (MFCA) on sustainable development. This study employed a quantitative method with panel data regression analysis using the Random Effects Model (REM). The sample consisted of 61 non-cyclical consumer sector companies listed on the Indonesia Stock Exchange for the 2021–2023 period, with a total of 183 observations. The results showed that Green Accounting does not have a significant impact on sustainable development, whereas Material Flow Cost Accounting (MFCA) has a positive and significant

impact on sustainable development. The findings indicate that material management efficiency and waste reduction through MFCA can support corporate sustainability, while the implementation of Green Accounting has not been implemented optimally in supporting strategic decision-making for sustainable development companies. The findings indicate that material management efficiency and waste reduction through MFCA can support corporate sustainability, while the implementation of Green Accounting has not been carried out optimally in supporting the company's strategic decision making.

Research conducted by Razak et al., (2023) entitled "Determinants Green Accounting to Sustainable Development on Mining Companies Listed on the IDX" aims to test the influence of green accounting which is measured through environmental performance, environmental costs, and environmental disclosure to Sustainable Development. This study uses a quantitative method with a causal comparative approach. The sample consisted of 15 mining companies listed on the Indonesia Stock Exchange for the 2017–2021 period, with a total of 75 observational data. The results indicate that environmental performance and environmental costs have no effect on sustainable development, while environmental disclosure has a positive and significant effect on sustainable development. This indicates that disclosure of environmental information in a company's annual report is able to increase the company's responsibility towards sustainability aspects, while the implementation of environmental performance and environmental costs has not been carried out optimally and therefore has not been able to support the company's sustainable development.

Research conducted by Nur & Susilowati, (2025) entitled "The Role of Corporate Social Responsibility Mediating Influence Green Accounting And Environmental Performance terhadap Sustainable Development" aims to analyze the role of Corporate Social Responsibility (CSR) in mediating the influence Green Accounting And Environmental Performance terhadap Sustainable Development. This study examined mining companies listed on the Indonesia Stock Exchange for the 2021–2023 period. This study used a quantitative method with purposive sampling and obtained 36 observational data from 12 mining companies. The results showed that Green Accounting does not have a significant effect on CSR or Sustainable Development, whereas Environmental Performance has a positive and significant effect on Sustainable Development but does not have a significant effect on CSR. In addition, CSR has a positive and significant effect on Sustainable Development, but unable to mediate the relationship between Green Accounting And Environmental Performance to Sustainable Development. This finding shows that the implementation of Green Accounting and the company's environmental performance is still not optimally integrated into the CSR program to support the company's overall sustainability.

II. METHOD

Types of research

This study employed a quantitative approach as its research method. This approach was used because this study aimed to examine the relationship between variables through numerical data analyzed using statistical techniques (Sugiyono, 2022). The data used were secondary data obtained through indirect sources, namely from documents published by the company. The research data source was the annual report (annual report) and sustainability reports (sustainability report) Companies in the basic materials sector. These documents were obtained from each company's official website, covering a five-year observation period, from 2021 to 2025.

Population and Sample

Research Population

The population in this study is all companies listed on the Indonesia Stock Exchange (IDX) in 2021–2025, based on data access on the IDX 2025, there are 113 listed companies with 512 listed consecutively during the 2021–2025 period.

Research Sample

The sample in this study was determined using the technique purposive sampling. This is a sampling technique based on certain criteria tailored to the research objectives (Sugiyono, 2022). The sample for this study was companies in the financial sector. basic materials (raw materials) listed on the Indonesia Stock Exchange during the 2021–2025 period and meeting the criteria established by the researcher. The sample criteria in this study include:

Sector companies basic materials listed on the Indonesia Stock Exchange (IDX) during the 2021–2025 period.

Companies that publish annual reports and/or sustainability report completely during the research period.

Companies that have related data green accounting, material flow cost accounting, environmental performance, And sustainable development.

The selection of the 2021–2025 period was carried out to obtain more relevant and up-to-date research data so that it can describe the implementation conditions. Green accounting, material flow cost accounting, environmental performance, And sustainable development in the company sector basic materials more comprehensively. The process of determining the research sample was carried out using the method purposive sampling based on the following criteria: Initial population: Sector companies basic materials listed on the Indonesia Stock Exchange (IDX) during the 2021–2025 period totaled 113 company. Reduction, Companies that do not issue annual report and/or sustainability report in full during the research period of 28 companies. Subtraction 2: Companies that do not have complete data related to Green Accounting, Material Flow Cost Accounting, Environmental Performance, And Sustainable Development as many as 18 companies. Based on the filtering criteria above, the number of obtained A sample of 67 companies was used. With a 5-year observation period (2021–2025), the total data analyzed covered 335 companies. observation (67 companies $\times$ 5 years).

III. RESULTS AND DISCUSSION

Panel data analysis on 67 sector companies Basic Material on the IDX for the 2021–2025 period (335 observations) using Fixed Effect Model with Robust Standard Errors shows that the regression model simultaneously has a very good and significant level of suitability in predicting Sustainable Development ($F = 54.935$; $p = 0.000$) with an R^2 value of 0.357. Partially, Material Flow Cost Accounting (MFCA) has a positive and significant effect on Sustainable Development ($\beta = 0.544$; $p = 0.000$), verifying that the efficiency of raw material traceability and waste suppression (non-product output) is a key driver of the company's economic and environmental sustainability. On the other hand, Green Accounting ($\beta = -0.136$; $p = 0.252$) and Environmental Performance ($\beta = -0.012$; $p = 0.532$) did not show a significant effect. This indicates that the allocation of environmental costs and the achievement of the PROPER predicate in this sector still tend to function only to fulfill regulatory obligations (compliance) and formal legitimacy alone, so that it has not been substantively integrated into the disclosure of sustainability governance based on international standards substantively into the disclosure of sustainability governance based on international standards.

IV. CONCLUSIONS

Based on the results of the analysis and discussion in the research regarding the Influence of the Implementation Green Accounting, Material Flow Cost Accounting, And Environmental Performance to Sustainable Development on Companies on the IDX (Study on the sector Basic Materials (Raw Goods) at the IDX 2021–2025), the following conclusions were obtained:

Implementation Green Accounting proven to have no significant effect on Sustainable Development in the company sector Basic Materials. This is because the amount of environmental costs allocated by companies is still relatively small compared to total operational costs, so it has not been optimally integrated into long-term business strategies. Environmental cost allocation is still often viewed as merely an additional operational burden to meet regulatory obligations (compliance) and build a positive image (legitimacy) alone, so it does not directly determine or improve the quality of a company's sustainability disclosure.

Implementation Material Flow Cost Accounting (MFCA) has been proven to have a positive and significant effect on Sustainable Development, and is also the most dominant driving factor in this research. Considering the industry Basic Materials heavily dependent on the use of large amounts of raw materials and energy, MFCA transparently helps companies track material flows and reduce costs from production waste (non-product output). This material management efficiency not only results in economic operational cost savings, but also significantly reduces the impact of environmental pollution, strengthens public legitimacy, and improves corporate sustainability disclosure.

Achievements Environmental Performance proven to have no significant effect on Sustainable Development in the company sector Basic Materials. Participation in and achievement of environmental performance ratings (such as the PROPER program) is still generally used by companies as a symbolic tool to meet minimum regulatory requirements so that the company can continue to obtain operating permits. Even though companies have achieved good environmental performance ratings, this has not been comprehensively transformed into sustainability reporting disclosures based on international standards (such as GRI Standards).

Based on the research results and conclusions above, the researcher provides several suggestions as follows:

For Sector Companies Basic Materials

The company is expected to improve the implementation of green accounting especially companies in the sector Basic Materials, is expected to improve the quality of implementation Green Accounting through more complete, transparent,

and consistent disclosure of environmental costs. In addition, companies need to continue optimizing the implementation of Material Flow Cost Accounting because it is proven to be able to increase Sustainable Development through efficient use of materials and reduction of production waste.

For Investors

The results of this study can be used as a consideration in making investment decisions. Investors should not only consider a company's financial performance but also its material management efficiency, as an indicator of its long-term sustainability.

For the Government, the Indonesia Stock Exchange, and the Financial Services Authority

The government, the Indonesia Stock Exchange (IDX), and the Financial Services Authority (OJK) are expected to continue strengthening regulations and increasing oversight of the implementation of sustainability practices in companies in the basic materials sector. Sustainability reporting standards are needed to ensure that disclosure of information on green accounting, material flow cost accounting, and environmental performance is more uniform, transparent, and easily comparable across companies. The government is also expected to provide incentives for companies that successfully implement effective environmental management, such as fiscal incentives, ease of licensing, and awards for environmental performance.

For Further Researchers

Future research is expected to expand this study by adding other independent variables suspected of influencing sustainable development, such as Environmental, Social, and Governance (ESG) Disclosure, Corporate Social Responsibility (CSR), Good Corporate Governance (GCG), Carbon Emission Disclosure, Eco-Efficiency, Environmental Management System (ISO 14001), and Corporate Carbon Performance. Further research can expand the research object to other industrial sectors listed on the Indonesia Stock Exchange, such as the energy, industrial, consumer non-cyclical sectors, or all non-financial companies, so that the research results have a broader level of generalization.

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