Green Accounting Concepts and Practices Towards Measuring Environmental Sustainability and Sustainable Business Value

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Abstract

This article discusses the concepts and practices of environmentally friendly accounting and their impact on environmental sustainability and sustainable business value. The concept of sustainability in business and environmental challenges in the Indonesian context is the main focus. Green accounting practices include reducing carbon emissions, efficient use of natural resources, and better management of industrial waste. Positive impacts include reduced carbon emissions, more efficient use of natural resources and better waste management. Companies that adopt this practice gain benefits in the form of improved reputation, operational efficiency, and competitive advantage. The article also notes that green accounting practices are not a one-size-fits-all approach to companies and must be adapted to each context. With technological developments, increasingly stringent regulations, and public awareness of environmental issues, green accounting practices will remain an integral part of sustainable business strategies in the future.

Keywords: *Green Accounting, Carbon Emission Reduction, Natural Resource Efficiency, Industrial Waste Management, Sustainable Business Value*.

A. INTRODUCTION

Environmental sustainability has become a central issue on the current global agenda. The world faces serious challenges related to climate change, declining air and water quality, loss of biodiversity, and increasing waste and pollution (Bucholz et al., 2020). This challenge creates a significant ecological impact and needs to be addressed immediately so that the earth remains a livable place for future generations. However, the importance of environmental sustainability is not only the responsibility of governments and non-profit organisations but also businesses around the world (Mio et al., 2022).

Business is one of the main factors that contributes to environmental impacts. Economic activities such as production, distribution, consumption and transportation produce greenhouse gas emissions, waste and excessive use of natural resources (Ullah et al., 2019). As global economic growth and urbanisation continue, pressure on natural resources and ecosystems is increasing (Hasan et al., 2019). Companies have a crucial role in reducing their negative impact on the environment and contributing to environmental sustainability. An illustration of Green Accounting can be seen in the following image:

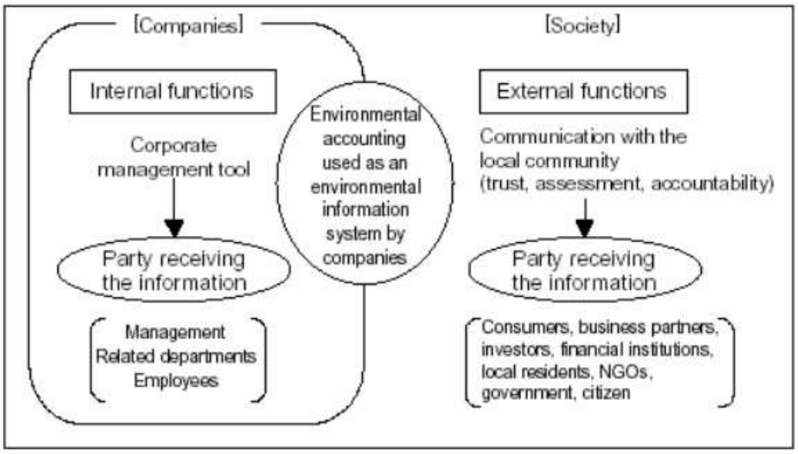

Figure 1. Internal & External Functions of Green Accounting
Source: Mahsina (2014)

In measuring and understanding the environmental impacts produced by business activities, the concept of green accounting has emerged as an essential tool. Green accounting is a broader accounting approach that includes information about a company's environmental performance, including measurements of carbon emissions, use of natural resources, and other impacts. This allows organisations to identify and manage environmental risks, as well as develop more sustainable business strategies, according to research conducted by Rahman et al. (2019).

Indonesia, with its extraordinary natural wealth, is one of the countries with the highest biodiversity in the world. However, rapid economic progress and urbanisation in recent decades have presented severe challenges to environmental sustainability in the country. In addition, rapid economic growth has also increased the contribution of businesses to environmental impacts, including increased greenhouse gas emissions, deforestation, and decreased water and air quality (Endiana et al., 2020).

Companies in Indonesia have an essential role in the country's economic development but also have a big responsibility for environmental sustainability (Susanto & Meirani, 2019). Industrial, agricultural, mining, and other sector activities influence Indonesia's unique ecosystem. In this context, it is essential to understand the contribution of businesses to environmental impacts and how they can play a role in maintaining environmental sustainability, which is essential for Indonesia's future (Meiryani et al., 2019).

Environmental sustainability is a crucial issue that needs to be addressed throughout the world. In Indonesia, environmental sustainability has a direct impact on people's lives, biodiversity, and the sustainability of natural resources that support agriculture, fisheries and other economic sectors. Harmony between economic growth, environmental sustainability and community welfare is a challenge that must be overcome to achieve sustainable development goals.

This article aims to discuss the concept and practice of green accounting in the context of modern business. The author will explain the critical role of environmental sustainability and the contribution of business to environmental impacts.

Additionally, we will explore how green accounting can help companies measure, manage and minimise their environmental impact while creating sustainable business value. Through a better understanding of the relationship between business and the environment, it is hoped that this article can provide valuable insights for business practitioners, academics and policymakers.

This article will be divided into several main sections. The following section will discuss the concept of green accounting in more depth, followed by an explanation of its implementation practices in business. Next, we will look at the positive impact of green accounting on environmental sustainability and sustainable business value. Finally, this article will close with conclusions and suggestions for further research. By understanding business's contribution to environmental impact and the importance of green accounting, we can create a solid foundation to continue this discussion and pave the way to a more sustainable business in the future.

B. LITERATURE REVIEW

1. Sustainability Concepts in Business and Environmental Challenges

The concept of sustainability in business is an essential foundation in modern business literature. Sustainability is often defined as the ability of an organisation to meet current needs without compromising the ability of future generations to meet their needs (Khan et al., 2021). Sustainable business models consider economic, social, and environmental aspects and try to strike the right balance between the three (Shah & Bhatt, 2022).

Environmental challenges in business are one of the main focuses of this research. In the literature, these challenges often include issues such as climate change, natural resource degradation, air and water pollution, and loss of biodiversity. The impact of these environmental challenges on business can be very significant, including financial, legal and reputational risks (Alkaabi & Nobanee, 2019). Understanding and overcoming environmental challenges is one of the critical elements in maintaining business sustainability.

Environmental performance measurement has also become an integral part of the literature on sustainability in business. These measurement methods may include measuring carbon emissions, ecological footprint, or sustainability indices. These environmental performance measurements enable organisations to track and manage their environmental impact more effectively, as well as to report their progress to stakeholders. In previous literature, many case studies and research examine how companies and organisations can face environmental challenges and apply sustainability concepts in their business practices (Trivellas et al., 2020).

2. The Role of Green Accounting in Measuring and Reporting Environmental Performance

Green accounting, also known as green accounting, is a broader accounting approach that includes information about a company's environmental performance. This concept developed in response to increasing concerns about the negative impact that business activities have on the environment. In the literature, green accounting is often seen as an effort to measure, manage and report the environmental impact of business activities (Le & Venkatesh, 2022).

The green accounting approach includes various elements, including measuring carbon emissions, use of natural resources, waste produced, and other impacts. This allows organisations to understand their environmental footprint better and identify areas where they can reduce their impact on the environment. Thus, green accounting helps companies measure and report their environmental performance more accurately (Hao et al., 2023).

In previous literature, several theories and frameworks have been developed to support the implementation of green accounting. For example, an approach based on ISO 14001, the international standard for environmental management, has been used by many companies as a basis for developing their green accounting systems. In addition, the Global Reporting Initiative (GRI) has provided guidelines used by companies to report their environmental performance transparently. Case studies and previous research also provide evidence that the use of green accounting can provide significant benefits for companies (Al-Baghdadi et al., 2021). This includes increased operational efficiency, better risk management, enhanced corporate reputation, and support for sustainable decision-making.

It is also essential to understand how information generated from green accounting practices is used in reporting a company's environmental performance. Reporting standards such as the Global Reporting Initiative (GRI) are often used to increase transparency in environmental reporting. The economic and non-economic benefits of green accounting practices are clarified, along with the challenges that companies face in adopting this approach, as research conducted by Di Vaio et al. (2020).

3. Previous Research on the Impact of Green Accounting Practices on Business

Green accounting concepts include a deep understanding of various methods of measuring environmental performance, such as measuring carbon emissions, use of natural resources and other ecological impacts. The following is previous research that has examined this sector:

a. Research entitled "How does corporate social responsibility contribute to firm financial performance? The mediating role of competitive advantage, reputation, and customer satisfaction" conducted by Saeidi, S. P., Sofian, S., Saeidi, P., Saeidi, S. P., & Saaeidi, S. A. in 2015. This research examines how green accounting practices impact a company's financial performance and finds that there is a positive relationship between green accounting practices and better business performance.
b. Research entitled "Effects of Environmental Strategy, Environmental Uncertainty and Top Management's Commitment on Corporate Environmental Performance: The Role of Environmental Management Accounting" conducted by Latan, H., Jabbour, C. J. C., de Sousa Jabbour, A. B.

L., Wamba, S. F., & Shahbaz, M. in 2018. This research investigates green accounting practices in Chinese, Indonesian and French companies and finds that companies that implement green accounting tend to have better environmental performance.

c. Research entitled "Does Adoption of ISO 56002-2019 and Green Innovation Reporting Enhance the Firm Sustainable Development Goal Performance? An Emerging Paradigm" conducted by Khan, P. A., Johl, S. K., & Johl, S. K. in 2021. This research analysed the impact of green accounting on company value and found that companies that implement green accounting have a higher value in the market.
d. Research entitled "Innovation with ecological sustainability: Does corporate environmental responsibility matter in green innovation" conducted by Hao, X., Fu, W., & Albitar, K. in 2023. This research investigates the relationship between green accounting practices and the environmental performance of companies in India and finds that green accounting positively impacts environmental performance.
e. Research entitled "Increasing productivity and sustainability of corporate performance by using management control systems and intellectual capital accounting approach" conducted by Dana, L. P., Rounaghi, M. M., Enayati, G., & Researcher, M. I. in 2021. This research explored the influence of green accounting on business performance, including financial and environmental aspects, and found a positive relationship between the two.
f. Research entitled "Digitalization and New Technologies for Sustainable Business Models at the Ship–Port Interface: A Bibliometric Analysis" conducted by Del Giudice, M., Di Vaio, A., Hassan, R., & Palladino, R. in 2022. This research reveals that companies that report good environmental performance tend to face lower risks, which can increase the stability of their business.

Previous research helps establish the background and context of the research. This helps readers and researchers understand why the research was conducted and the topic's relevance in the broader scientific realm.

C. METHOD

The authors adopted a mixed approach, including quantitative and qualitative data analysis. The author collected quantitative data from financial reports and sustainability reports of several large companies operating in various industrial sectors in Indonesia. Data is taken from operational reports from the last five years (2018-2022); data was taken from the Indonesian Stock Exchange with a limited population, namely only companies operating in the property and manufacturing sectors; the research population was 15 for Company best represents and meets the requirements of each business field, and compares two companies with different sectors regarding operations and business focus. Qualitative data was obtained through in-depth interviews with these companies' accounting professionals and environmental managers. The author uses an adequate theoretical framework to analyze this data, including green accounting indicators and environmental performance measurement methods. Statistical and qualitative analysis is used to identify the relationship between green accounting practices and their impact on environmental sustainability and sustainable business value.

This research also involves a comprehensive literature review to understand the concept of green accounting and its related practices globally and in the Indonesian context. The author takes inspiration from previous research to formulate appropriate hypotheses and research questions. The author designed this method to provide an in-depth understanding of how green accounting can contribute to environmental sustainability and sustainable business value, especially in the business context in Indonesia.

D. RESULT AND DISCUSSION

1. Analysis of Green Accounting Practices

At Harmony Elektrindo Ltd., located in Central Java, green accounting practices have become an integral part of the company's sustainability strategy. These companies adopt various measures to measure, report and improve their environmental performance. The following are the results of the author's in-depth interviews with accounting professionals and environmental managers in sample companies, which are presented in the following table:

Table 1. Results of In-Depth Interviews with Accounting Professionals and Environmental Managers at Company

Question Topic	Question	Answer
Use of Environmental Performance Indicators	What key environmental performance indicators does Harmony Elektrindo Ltd. use to measure the environmental impact of their operations?	We measure our environmental impact with key indicators such as energy consumption, carbon emissions, water use and raw material use.
	How does Harmony Elektrindo Ltd. collect and monitor data regarding these indicators?	We have an integrated monitoring system that automatically records data such as energy consumption and emissions every day. Additionally, we conduct regular audits to verify the data.
	What are Harmony Elektrindo Ltd.'s efforts to increase resource use efficiency based on environmental performance indicator data?	After analysing the data, we identify areas where we can be more efficient, for example, by replacing old equipment with more energy-efficient ones or by implementing efficiency practices in production processes.
Environmental Performance Reporting	How does Harmony Elektrindo Ltd. report their environmental performance to stakeholders?	We publish an annual sustainability report that includes all our environmental performance data and the steps we have taken to reduce our environmental impact. This report

		is available on our website, and we also send it to key stakeholders.
	Does Harmony Elektrindo Ltd. have any specific sustainability certifications or labels used in environmental performance reporting?	Yes, we have ISO 14001 certification, which covers environmental management standards. We also use sustainability labels in our products.
	How does Harmony Elektrindo Ltd. ensure that its environmental performance reports are accurate and transparent?	We have an internal team responsible for ensuring the accuracy of our data. In addition, we regularly invite external parties to conduct independent audits of our reports.
Integrating Green Accounting Practices	How does Harmony Elektrindo Ltd. ensure that green accounting practices are integrated into company policies and procedures?	Green accounting practices have become part of our organisational culture. We have policies that explicitly include green accounting practices in resource use, product development and business decision-making.
	How does Harmony Elektrindo Ltd. involve employees in implementing green accounting practices?	We provide training to our employees on sustainable practices and green accounting. Additionally, they have access to internal guidance that explains how they can contribute to green accounting practices in their day-to-day.
	What is the biggest obstacle that Harmony Elektrindo Ltd. faces in integrating green accounting practices?	One of the biggest obstacles is changing organisational culture. Some employees may need time to adapt to these changes and understand the importance of green accounting practices.

Source: Processed Primary Data

First, in terms of the use of environmental performance indicators, Harmony Elektrindo Ltd. has identified several critical indicators used to measure the environmental impact of their operations. One key indicator is energy use. Companies regularly monitor their energy consumption and have annual energy reduction targets. Additionally, they closely monitor water usage, greenhouse gas emissions, and raw material usage. These indicators help companies measure their environmental impact systematically.

Second, Harmony Elektrindo Ltd. publishes an annual sustainability report related to environmental performance reporting that includes all their environmental performance data and achievements. This report includes information about the previously mentioned environmental performance indicators, as well as steps that have been taken to reduce environmental impacts. These publicly available sustainability reports serve as an essential transparency tool in communicating with stakeholders, such as investors, consumers and environmental NGOs.

Third, integrating green accounting practices into company policies and procedures has become essential to Harmony Elektrindo Ltd.'s organisational culture. They have developed policies that lead to more efficient use of resources, including energy, water and raw materials. All company employees are provided with training regarding sustainable practices and green accounting and are expected to contribute to efforts to reduce the company's environmental impact. The company's management actively supports sustainable initiatives and ensures that green accounting practices are essential to every business decision.

These companies have successfully integrated green accounting practices into various aspects of their operations, from measuring environmental performance to company policies and procedures. This helps them in achieving environmental sustainability goals and sustainable business value. Meanwhile, the second interview, which was conducted with environmental managers at Murni Jaya Abadi Ltd., which operates in the manufacturing sector, is presented in the following table:

Table 2. Results of the Second Interview with Murni Jaya Abadi Ltd.'s Environmental Manager

Number	Question	Answer
1	How does Murni Jaya Abadi Ltd. define and understand the concept of "green accounting" in its operational context?	The concept of green accounting in Murni Jaya Abadi Ltd. is understood as an approach that integrates sustainability practices and environmental impact measurement in the accounting and financial reporting processes.
2	What types of environmental performance indicators are most relevant and frequently used in Murni Jaya Abadi Ltd. to measure the environmental impact of its operations?	We often use environmental performance indicators such as greenhouse gas emissions, energy consumption, water use and the amount of waste generated as key parameters to measure our environmental impact.
3	How does Murni Jaya Abadi Ltd. collect and monitor data related to environmental performance indicators?	We have a computerised monitoring system to collect real-time data regarding environmental performance indicators. Our dedicated team manages and verifies this data on a regular basis.
4	What concrete efforts has Murni Jaya Abadi Ltd. taken to reduce its environmental impact, based on the data it has collected?	We have taken various actions, such as increasing energy efficiency in production processes, adopting green technology, and reducing the use of environmentally unfriendly raw materials.
5	How does Murni Jaya Abadi Ltd. involve employees in implementing green accounting practices?	We provide training to our employees on sustainable practices and the importance of green accounting. Employees also have access to internal guidance explaining how to contribute to green accounting practices.
6	How does Murni Jaya Abadi Ltd. ensure that its environmental performance reports are accurate and transparent?	We engage an internal team responsible for verifying our data on a regular basis. In

		addition, we invite external parties to conduct independent audits of our reports.
7	Does Murni Jaya Abadi Ltd. have environmental performance targets set? If so, how are they measured and monitored?	Yes, we have environmental performance targets set to reduce greenhouse gas emissions and use of specific resources. We monitor our progress against these targets regularly and take corrective action as necessary.
8	How does Murni Jaya Abadi Ltd. communicate with external stakeholders about their green accounting practices and environmental performance?	We publish an annual sustainability report that includes all our environmental performance data. This report is available on our website, and we also send it to key stakeholders.
9	Does Murni Jaya Abadi Ltd. see green accounting practices as a competitive advantage? How does this affect their business strategy?	Yes, we believe that green accounting practices can provide a competitive advantage. This influences our business strategy by encouraging innovation in the use of resources and maintaining our company's reputation as an environmentally conscious company.
10	Does Murni Jaya Abadi Ltd. have future development plans or initiatives regarding green accounting practices?	We continually look for opportunities to improve our green accounting practices. We are considering the use of renewable energy and collaboration with suppliers committed to environmental sustainability.

Source: Processed Primary Data

The results of the analysis show that there are significant variations in green accounting practices between different industrial sectors. In the manufacturing sector, companies tend to have more structured green accounting practices and focus on energy efficiency and waste management. They often adopt greener technologies and report regularly on carbon emission reductions. On the other hand, service sectors such as the financial and information technology sectors place greater emphasis on the use of technology to reduce their environmental footprint, such as the use of energy-efficient servers or paper consumption reduction strategies.

Within the manufacturing sector, some of the best practices that can be identified involve investing in green technologies to reduce emissions and waste. Some companies have developed more energy-efficient production processes and adopted sustainable raw material practices. In the service sector, best practices often involve steps to reduce energy consumption, such as utilising solar power or energy-saving technologies. Please note that these best practices do not necessarily apply to every company in the sector. Variability depends on company size, available resources, and management's commitment to sustainability. Therefore, a significant emphasis is placed on adapting and scaling best practices to meet the Company's unique needs (Afshan et al., 2022).

The results of this analysis have significant implications for environmental sustainability. The diversity of green accounting practices between industry sectors indicates that no single approach is suitable for all companies. Instead, it is essential to understand the respective industry context and implement best practices that suit the company's needs. The best practices identified in each sector can be a source of inspiration for other companies to adopt more effective green accounting practices. This can help companies achieve their environmental sustainability goals and contribute to global efforts to reduce negative environmental impacts.

2. Impact of Green Accounting Practices

Green accounting practices have a significant impact in three main aspects: reducing carbon emissions, efficient use of natural resources, and industrial waste management. Data from research comparing these three points between the two companies that are the focus of the research are presented in the following data:

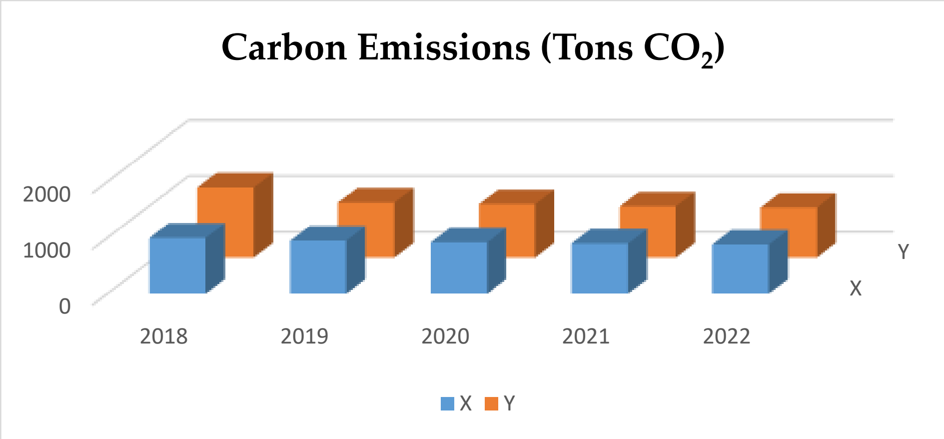

Figure 2. Carbon Emission Reduction Trends in Two Companies

Source: processed primary data

In this data, we see a decreasing trend in carbon emissions from companies over the last five years. The reduction in carbon emissions shows that the green accounting practices that companies have adopted are successful in reducing their environmental impact. This is a positive indicator of the company's commitment to environmental sustainability. A sustained reduction in carbon emissions can also contribute to a company's reputation and meet stricter regulatory requirements regarding carbon emissions.

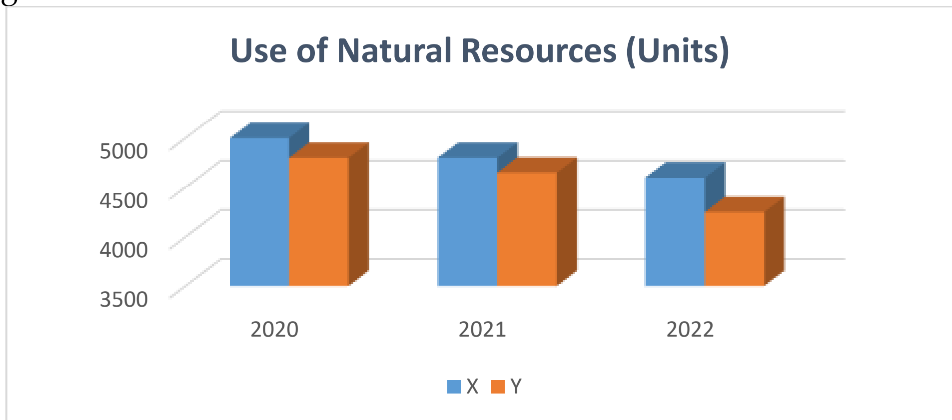

Figure 3. Efficient Use of Natural Resources

Source: processed primary data

This data illustrates the increase in efficiency in the use of the company's natural resources from year to year. A decrease in the use of natural resources is a sign that a company has adopted more efficient practices in its production process. This can result in cost savings in the long term as the company reduces its dependence on natural resources that may be expensive or limited. In addition, efficient use of natural resources also has the potential to reduce the impact of natural resource extraction on the environment.

By looking at these three data together, we can conclude that the green accounting practices that companies have adopted have had a positive impact on their environmental performance. Reducing carbon emissions, increasing the efficiency of natural resource use, and better waste management are signs of a company's commitment to environmental sustainability and operational efficiency.

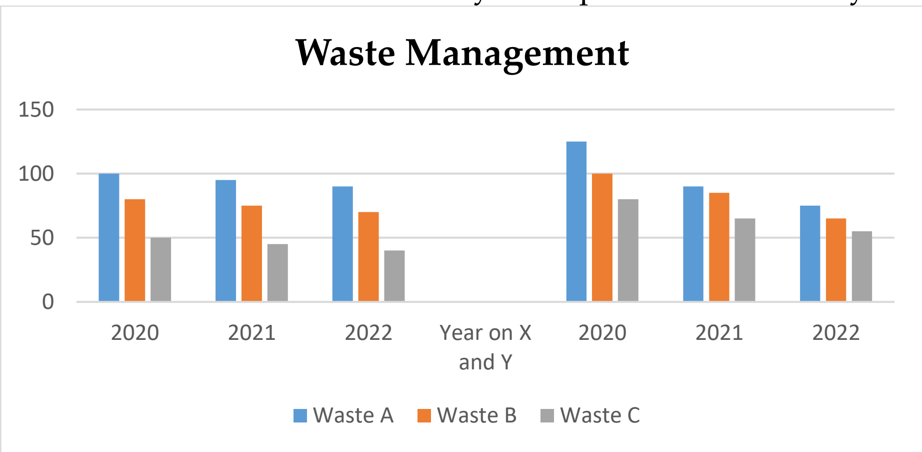

Figure 4. Corporate Waste Management

Source: processed primary data

Waste management data describes the type and volume of waste produced by the company from year to year. In this example, we can see a decrease in waste volume in several types of waste (Waste A, Waste B, Waste C). This shows that the company has succeeded in improving its waste management. Reducing waste volumes can reduce waste management costs and potentially reduce negative environmental impacts. With better waste management, companies can better meet environmental regulations and standards.

Based on research data, there are three crucial points which are main points and indicators that a company has succeeded in implementing green accounting in its business:

a. Carbon Emission Reduction

Green accounting practices often focus on reducing greenhouse gas and carbon dioxide (CO_2) emissions. The impact of green accounting practices in terms of reducing carbon emissions includes: 1) Increased Energy Efficiency: Companies can adopt technologies and processes that are more efficient in energy use, which reduces CO_2 emissions resulting from the use of fossil energy; 2) Investment in Renewable Energy: Green accounting practices can encourage companies to invest in renewable energy sources such as solar panels and wind power, which reduces dependence on fossil fuels; 3) Reducing Product Carbon Footprint: Companies can calculate the carbon footprint of their products and look for ways to reduce it, both by reducing emissions during production and throughout the product life cycle; and 4) Reputation Benefits: Successful green accounting practices can improve a company's reputation as a company that cares about the environment, attracting customers and stakeholders who also care about environmental issues (Riyadh et al., 2022).

b. Efficient Use of Natural Resources

Green accounting practices encourage companies to use natural resources more efficiently. The impacts include: 1) Cost Savings: More efficient use of natural resources can reduce company operational costs, such as energy, water and raw material costs; 2) Reducing Pressure on Limited Natural Resources: By reducing consumption of natural resources, companies help reduce pressure on limited resources and help maintain the sustainability of natural ecosystems; 3) More Environmentally Friendly Products: Green accounting practices can encourage innovation in the development of products that are more efficient in using natural resources and produce less waste (Malik et al., 2021).

c. Industrial Waste Management

Green accounting practices also have an impact on industrial waste management. Impacts include 1) Waste Reduction: Companies can adopt practices that produce less waste or convert waste into valuable resources; 2) Regulatory Compliance: Green accounting practices help companies comply with strict environmental regulations regarding waste management, which can avoid fines and sanctions; 3) Positive Reputation: Good waste management can improve a company's reputation as an environmentally responsible entity (Kasayanond et al., 2019).

In real terms, green accounting practices have a positive impact on a company's environmental and business performance. They help reduce negative impacts on the environment, save on operational costs, and improve a company's reputation, all of which contribute to a company's long-term sustainability.

E. CONCLUSION

Green accounting practices are not only a tool for measuring and reporting a company's environmental performance but also a driver of change in company operations. In this context, green accounting practices help companies reduce negative environmental impacts, increase operational efficiency and gain competitive advantage. The positive impact can be seen in reduced carbon emissions, more efficient use of natural resources, and better management of industrial waste. In conclusion, green accounting practices are becoming an essential part of sustainable business strategies in the future, with companies that incorporate environmental sustainability into the core of their business benefiting both in terms of environmental sustainability and business value.

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