The Relationship between Awareness and Implementation of Environmental Management Accounting–Evidence from Small and Medium-Sized Enterprises in Thailand

Sakaya Klongyut and Parichat Jantori, Thammasat University, Thailand

Date Received: 31 January 2024 Revised: 17 April 2024 Accepted: 25 April 2024

Abstract

In this study the relationship between awareness and implementation of Environmental Management Accounting within small and medium-sized enterprises listed in Market for Alternative Investment in Thailand was explored. A descriptive and correlational study design was adopted, and questionnaires were used to collect data from 57 small- and medium-sized Thai enterprises. The results provided empirical evidence that these firms had a moderate to high level of awareness of some aspects of environmental management accounting, and were practicing it to a certain extent. Furthermore, a positive correlation (.500, $p < .01$) between environmental accounting awareness and accounting practice was found. Hence, this implied that when firms were aware of the impact of environmental disclosures on their operations and had access to environmental management accounting knowledge, they were more likely to adopt appropriate accounting practices. The implementation of environmental accounting among small to medium enterprises in Thailand is still in the early stages. Further support and development are required to foster implementation. Further studies are encouraged–both qualitative studies to gain deeper insights into challenges of implementing environmental management accounting, and quantitative studies about factors that would better enable its practice.

Keywords: *Environmental management accounting, awareness, implementation, small-medium enterprises*

Introduction

Due to environmental issues and climate change, more companies are recognizing the urgent need to act sustainably and be socially responsible. Sustainability has become a requirement for all companies and across all industries. Sustainability refers to a business approach that creates long-term value by taking into consideration how a given organization operates in its ecological, social, and economic environments (Klein et al., 2022). Many companies are including environmental concerns in their key business strategies. Hence, environmental management accounting (EMA) has been introduced and is highly encouraged, as it supports internal environmental management processes and reduces environmental risks and associated environmental costs.

Previous studies have focused primarily on big companies listed in the dominant stock exchange market in developed countries, as these companies are more likely to adopt and implement environmental management accounting (Manitsornsak, 2013). This is consistent with the studies of Li (2004) and Jalaludin et al. (2011), who found that the understanding and adoption of environmental management accounting in Asian countries, such as China or Malaysia, were relatively low when compared with advanced countries on other continents.

Nevertheless, there is a lack of recent studies regarding the implementation of environmental management accounting in Small and Medium-Sized Enterprises (SMEs), especially in Thailand. Some studies were conducted a decade ago, but they do not provide a current picture of how environmental management accounting is being practiced.

Thus, the aim of this study was to explore the environmental management accounting practices among SMEs in Thailand, as well as to examine the relationship between environmental management accounting awareness and its implementation. Research participants were companies listed in the Market for Alternative Investment (MAI) in Thailand, which was established in 1999 and serves as an alternative stock market for small and medium-sized enterprises. The companies listed in MAI are novel and innovative SMEs with high growth potential.

A study of such companies may yield fruitful information about the current state of environmental management accounting practices, and the empirical evidence gained may be useful in formulating recommendations encouraging SMEs to adopt environmental management accounting.

Literature Review

Sustainable Development and Corporate Social Responsibility

Sustainable development is a concept that has been developed for decades. The UN has defined sustainable development as development that meets the needs of the present, without compromising the ability of future generations to meet their own needs (United Nations, 2023). It aims to balance three key interests, namely economic development, environmental protection, and social well-being.

On the other hand, corporate social responsibility is a management concept in which companies put social and environmental considerations into their business strategy and operations, as well as into how they interact with their stakeholders. It is done rather on a voluntarily basis and is self-regulated by businesses. They attempt to be responsible for people, the planet, and profit, or the so-called triple-bottom line (Miller, 2020).

Nowadays, sustainable and environmental concerns have become a key responsibility in all countries. Increasing numbers of companies are recognizing the urgent need to act on a sustainable and socially responsible basis. Corporate Social Responsibility is becoming a business obligation. Hence, companies are required to deal with their stakeholders in an ethical manner. They have to integrate social and environmental concerns in their business operations and interactions with stakeholders, as well as to be responsible for both monetary and non-monetary profits.

Environmental Management Accounting (EMA)

Due to a growing interest in social responsibility and the environment, companies are making substantial efforts to incorporate social and environmental features into their regular operations. Companies must comply with environmental standards and manage in such a way that minimizes the environmental impact (International Federation of Accountants, 2005). Hence EMA, also known as green accounting or sustainable accounting, is increasingly encouraged in companies in order to minimize negative environmental impacts and costs.

Environmental management accounting complements management accounting approaches to financial accounting. It employs a conventional accounting framework, but also includes environmental preservation aspects. Such accounting aims to develop appropriate mechanisms that enable the identification and allocation of environmental costs, such as emissions treatment, disposal, environmental protection and management (Bennett & James, 1998; Wilmhurst & Frost, 2001).

The benefits of EMA are manifold. It supports the decision making process of the management team, as EMA may provide information regarding environmental impacts, which encompass economic drivers and also consequences of environmental issues. Environmental management accounting is also helpful in finding the causes of environmental problems, providing suggestions on how environmental improvements can be made, and exploring how these will affect the organization's economic performance. Thus, it shapes the strategies and actions of companies and encourages them to act responsibly (Wahyuni, 2009).

Research on the Implementation of Environmental Management Accounting

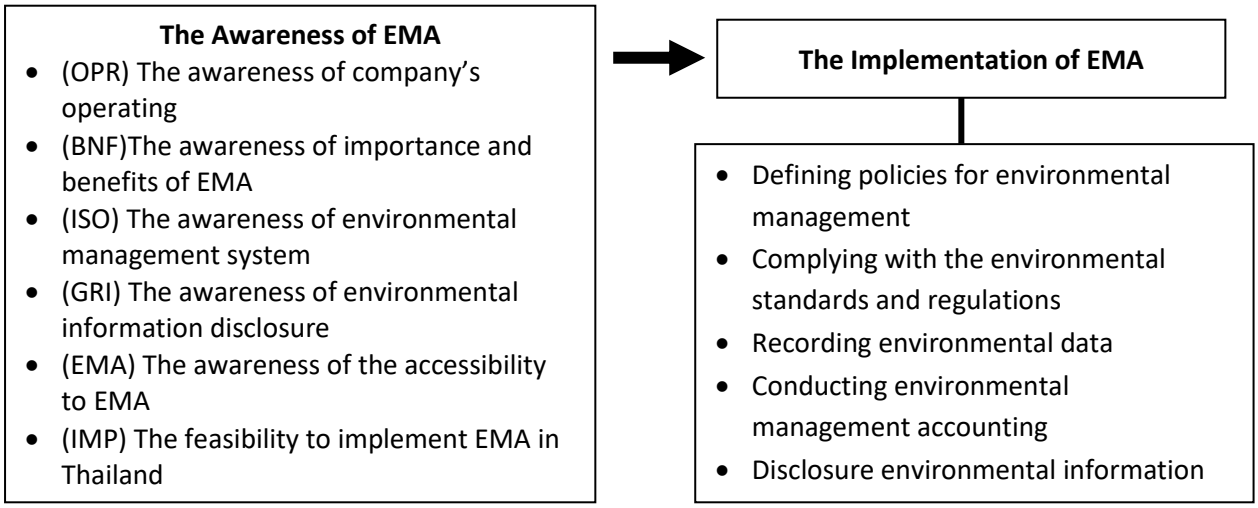
Despite increasing concern for the environment and the importance and benefits of EMA, the degree to which EMA is being practiced is weak in firms, especially in developing countries (Jamil et al., 2015). This is consistent with a previous study conducted by Li (2004) in China. He indicated that awareness of International Organization for Standardization standards (ISO 14001) enhanced the development of EMA. Despite this, the adoption rate of EMA was relatively low. The key challenge appeared to be a lack of quantitative measurement and a data retrieval system for environmental accounting information. This made EMA difficult to apply.

The challenges and factors affecting EMA implementation are diverse. Key barriers include incoherent government policies, unavailability of resources and technology, lack of expertise, and deficiencies in environmental reporting (Mukwarami et al., 2023). In a study conducted by Dinh et al. (2022), it was found that coercive pressure from governments, regulators, customers, suppliers, and investors had the greatest influence on EMA implementation in pulp and paper manufacturing enterprises in Vietnam. These results are aligned with a study conducted by Vu (2022) in a variety of manufacturing enterprises in Vietnam. Additionally, a study conducted by Jamil et al. (2015) in Malaysia revealed that coercion is a vital factor leading to EMA implementation among small and medium-sized manufacturing firms. A study by Setthasakko (2010) found that the major challenges in adopting EMA practices in pulp and paper companies in Thailand were a lack of organizational learning, focusing on short-term enterprise profits, and a lack of adequate EMA guidance.

Some EMA research has been conducted in recent years. But previous studies primarily focused on EMA practices in large enterprises or companies listed in the dominant stock exchange or specific industries. Hence, the current state of implementation of environmental management accounting in SMEs is unclear. The objective of this study was to examine the EMA practices among SMEs in Thailand, specifically the awareness and behavior of those involved in EMA implementation.

The study framework is illustrated in Figure 1 below.

Figure 1 *Study Framework*



Code. Awareness of Company's Operations (OPR), Awareness of Importance and Benefits of EMA (BNF), Awareness of Environmental Management Systems (ISO), Awareness of Environmental Information Disclosure (GRI), Awareness of Accessibility to EMA (EMA), and Awareness of Feasibility to Implement EMA in Thailand (IMP).

Methodology

A quantitative research approach was employed in this study. Self-administered online questionnaires were used as the primary data collection tool from the 206 companies listed in the Market for Alternative Investment (MAI). The majority of companies were recently established small and medium-sized enterprises. They were divided into eight business groups, namely agricultural and food processing, technology, natural resources, finance, services, real estate and construction, industrial products, and consumer goods.

Those enterprises possessing background experience in environmental management accounting were asked to complete the questionnaires; executives or accounting managers were the targeted respondents. The questionnaire was divided into three sections. The first part dealt with respondents' demographic information, such as age, gender, education, years of service, etc. The second part focused on awareness of environmental management, which included awareness of a company's operations, awareness of the importance and the benefits of EMA, awareness of EMA systems

according to ISO, awareness about environmental information disclosures according to GRI standards, awareness of accessibility to EMA, and feasibility to implement EMA in Thailand. A 5-point Likert scale was used to assess awareness. The scores were interpreted as follows: 1.00–1.80 = *Very Low Awareness*, 1.81–2.60 = *Low Awareness*, 2.61–3.40 = *Moderate Awareness*, 3.41–4.20 = *High Awareness*, and 4.21–5.00 = *Very High Awareness*.

The third part of the questionnaire explored the behavioral intention or implementation action of environmental management accounting, which was divided into five behavioral dimensions, namely: (1) Defining policies for environmental management, (2) complying with the environmental standards and regulations, (3) recording environmental data and using it for business optimization, (4) conducting environmental management accounting, and lastly (5) disclosure of environmental information. Each dimension was allotted a full score of four, for a total score of 20. The average score of each dimension and the average total score were calculated, as these represented each behavioral dimension and overall implementation of environmental management accounting. The overall average scores were interpreted as follows: 0.00–4.00 = *Very Low Implementation*, 4.01–8.00 = *Low Implementation*, 8.01–12.00 = *Moderate Implementation*, 12.01–16.00 = *High Implementation*, and 16.01–20.00 = *Very High Implementation* or *Fully Implemented*. The scoring system and interpretations are illustrated in Table 1.

Table 1 *Scoring System and the Score Interpretation*

Behavioral Dimensions	Total Average Score	Score Interpretation
1. Defining policies for environmental management	4	
2. Complying with the environmental standards and regulations	4	0.00–0.80 = Very Low Behavior 0.81–1.60 = Low Behavior
3. Recording environmental data	4	1.61–2.40 = Moderate Behavior
4. Use of data for business optimization	4	2.41–3.20 = High Behavior
5. Disclosing environmental information	4	3.21–4.00 = Very High Behavior
6. Total Averaged Score for All Dimensions (= Overall implementation of EMA)	20	0.00–4.00 = Very Low Implementation 4.01–8.00 = Low Implementation 8.01–12.00 = Moderate Implementation 12.01–16.00 = High Implementation 16.01–20.00 = Very High Implementation or Fully Implemented

A pilot test was conducted with companies listed in the Stock Exchange of Thailand (SET) that possessed similar characteristics as the target firms in this study. SET and the MAI are stock exchanges in Thailand, but the SET index is the oldest and the most cited equity index. It is designed for large and medium-size enterprises, while MAI is for small and medium enterprises. The reliability of the information gathered in the pilot survey returned a reliability score (Cronbach's Alpha Coefficient) of .891, which was within an acceptable range. Thus, the questionnaire was valid and reliable for use in the study.

Descriptive analysis, such as frequencies, means, and standard deviations were applied, as one of the objectives of the study was to assess the awareness of EMA in different aspects, such as its existence, benefits, accessibility and feasibility, and the ways in which EMA was being practiced. Moreover, a correlation analysis was conducted to identify the relationship between the awareness and implementation of environmental management accounting.

Results and Discussion

In the study, the current situation was examined relating to the implementation of environmental management accounting (EMA) in small and medium enterprises listed in the Market for Alternative Investment (MAI), Thailand. The self-administered online questionnaires were sent to the target

companies with a request for those involved in environmental accounting, such as managers and accounting managers, to answer the questions. Out of 206 companies, 57 companies from eight industries completed and submitted questionnaires. This accounted for 27% of the companies listed in MAI. Macpherson and Wilson (2003) acknowledged that a low response rate was common when conducting research with small and medium-sized enterprises, as it was relatively difficult to engage SMEs owners to complete questionnaires. For this study, those who completed the questionnaires were in management positions, possessed a high level of education, and had working experience in excess of one year. Respondent profiles and demographic information indicated that they were active in their positions and possessed the necessary knowledge and experience, and thus were able to provide the requested information.

Firm profiles and respondent demographics are shown in Tables 2 and 3 (following page).

Table 2 *Responded Companies Classified by Industry*

Industry	Number of Companies	Percentage
Agro & Food Industry	2	3.50
Technology	11	19.30
Resources	4	7.00
Financials	2	3.50
Services	11	19.30
Property and Construction	12	21.10
Industrials	8	14.00
Consumer Products	7	12.30
Total	**57**	**100.00**

Table 3 *Respondent Demographics*

Items	Frequency (%)
Gender	
Male	33.30
Female	66.70
Age (years)	
> 30	14.00
30–40	35.10
41–50	33.30
< 50	17.60
Education	
Lower than Bachelor Degree	0.00
Bachelor Degree	50.90
Master Degree	45.60
Higher than Master Degree	3.50
Position	
Management Position or Equivalent	40.40
Accounting Manager or Equivalent	17.50
Finance Manager or Equivalent	3.50
Other Positions related to EMA	38.60
Working Experience	
< 1 year	1.80
1–3 years	24.60
3–5 years	19.30
> 5 years	54.30

The level of environmental awareness was assessed together with environmental behavior. Specifically, the level of EMA implementation within a company was examined. Additionally, the relationship between environmental awareness and behavior that resulted in EMA implementation was analyzed. The results are shown in Table 4 and the following tables.

Table 4 *Level of Environmental Awareness*

Items	Mean	*SD*	Interpretation
Awareness of Company's Operating (OPR)	3.38	0.70	Moderate Awareness
Awareness of Importance and Benefits of EMA (BNF)	3.59	0.81	High Awareness
Awareness of Environmental Management System (ISO)	3.15	0.93	Moderate Awareness
Awareness of Environmental Information Disclosure (GRI)	3.76	0.78	High Awareness
Awareness of the Accessibility to EMA (EMA)	3.19	0.56	Moderate Awareness
Awareness of Feasibility to Implement EMA in Thailand (IMP)	3.44	0.94	High Awareness

Environmental awareness was assessed using a 5-point Likert scale. The scores were interpreted as shown in Table 4. Respondents had moderate awareness of some aspects, such as the company' operations, the environmental management system, and also their accessibility to environmental management accounting. This implied that companies knew that their operations may impact the environment somewhat. They also knew that some standards for environmental management such as ISO 14001 existed, and they were able to some extent to access information about environmental management accounting. Furthermore, responding companies had a high awareness about the important and benefits of EMA. They were also highly aware about environmental information disclosure standards such as GRI, and that it was possible to implement EMA in Thailand.

According to GRI Standard 2023, the level of environmental implementation may be classified under five behavioral dimensions varying from Defining Policies for Environmental Management, Complying with the Environmental Standards and Regulations, Recording Environmental Data, Conducting Environmental Management Accounting, and Disclosure of Environmental Information. The maximum score at each level was four, and an overall total score of 20 was possible, which indicated the level of implementation varying from Very Low Implementation (0.00–4.00) to Very High Implementation (16.01–20.00).

Results presented in Table 5 show that respondents adopted a moderate level of environmental implementation (an average score of 11.73). Companies strictly integrated environmental issues in their operations by defining policies–that is, they assessed environmental problems potentially caused by their operations and implemented policies to avoid or mitigate these problems. These policies were communicated among employees. Additionally, they exhibited a high level of compliance with environmental standards and also recorded environmental data. These findings were aligned with those previous study by Nguyen (2022), which revealed that institutional pressure plays an important role in enforcing EMA practice.

Table 5 *Level of Environmental Implementation within Surveyed MAI Companies*

Behavioral Dimensions	Mean	*SD*	Interpretation
Defining Policies for Environmental Management	3.12	1.16	High Implementation
Complying with the Environmental Standards and Regulations	3.11	0.83	High Implementation
Recording Environmental Data	2.93	1.06	High Implementation
Conducting Environmental Management Accounting	0.82	1.37	Low Implementation
Disclosure Environmental Information	1.74	1.28	Moderate Implementation
Overall Implementation of Environmental Management Accounting	11.73	4.14	Moderate Implementation

Nevertheless, the group surveyed in this study were not likely to conduct environmental management accounting, since these scores indicated a low level of implementation. But they did disclose some environmental information to comply with regulatory requirements. To put it bluntly, implementation of EMA and environmental information disclosure was still limited among small- and medium- sized companies. The reasons for low implementation of EMA have been explained in some previous studies. These included a lack of quantification tools, complicated government policies, a lack of EMA guidance, unavailability of resources and technology, as well as internal factors such as a lack of expertise and knowledge and a short-term profit orientation (Li, 2004; Setthasakko, 2010; Mukwarami et al., 2023)

Additionally, factor analysis was conducted to examine relationships and patterns that emerged among the environmental awareness elements. The Kaiser-Meyer-Olkin coefficient obtained was .758 (above .60 required for adequacy), which indicated a satisfactory value to conduct factor analysis. Thus, all six factors, including the awareness of company operations, awareness of the importance and benefits of EMA, awareness of environmental management systems, awareness of environmental information disclosures, awareness of accessibility to EMA, and feasibility to implement EMA in Thailand were correlated and could be grouped into a new factor, Awareness of Environmental Management Accounting. Sphericity was not violated, as a Barlett's test returned a value significance at the .000 level.

Table 6 *Factor Analysis*

Environmental Awareness Elements	Kaiser-Meyer-Olkin Coefficient
Awareness of Company's Operating (OPR)	.699
Awareness of Importance and Benefits of EMA (BNF)	.771
Awareness of Environmental Management System (ISO)	.653
Awareness of Environmental Information Disclosure (GRI)	.724
Awareness of the Accessibility to EMA (EMA)	.732
Awareness of Feasibility to Implement EMA in Thailand (IMP)	.826
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.758

Lastly, the relationship between the awareness and implementation of environmental management accounting was examined by conducting a Pearson's correlation analysis. This analysis is normally applied to identify linear relationships between two variables. The result obtained is shown in Table 7. The Pearson correlation coefficient (*R*) of .500 indicated that a moderate positive correlation existed between Awareness of Environmental Management Accounting and Implementation of EMA. This implied that the level of EMA implementation might be increased by greater awareness of the environmental impacts caused by business operations, awareness of the benefits of environmental management accounting, as well as knowledge about regulations and standards for environmental management, along with environmental disclosure. These results were aligned with previous studies conducted in a variety of manufacturing industries by Dinh et al. (2022) and Vu (2022).

Table 7 *Pearson's Correlation between the Awareness and the Implementation of EMA*

Variable	Implementation	Awareness
Awareness	1	
Implementation	.500**	1

Note. **Correlation is significant at the .01 level.

Conclusion and Implications

A growing interest in social responsibility and the environment are forcing all sizes and types of companies to adopt and comply with environmental standards, not only at operational levels, but also in their accounting practices. Thus, environmental management accounting was proposed in the late 1980s, and since then business organizations and professional bodies have been highly encouraged to adopt them, as it is believed that EMA will help business organizations to identify and avoid environmental problems. These practices also may lead to environmental improvements and better economic performance.

Previous studies have revealed that EMA has been practiced in big corporations in leading advanced countries. For SMEs in developing countries, it is still in its early stages and little research exists. Thus, in this study, environmental awareness and the extent to which EMA has been implemented and practiced by small and medium-sized enterprises listed in the MAI was also explored. The aim also was to identify the relationship between these two factors by conducting a Pearson's correlation analysis.

The study has provided empirical evidence on the extent to which small and medium-sized enterprises listed in the MAI were aware of environment management accounting. This included awareness of its existence and its roles in managing and enhancing the environment, and also awareness about the accessibility of EMA information, as well as the feasibility of implementing EMA in their organizations. The level to which EMA was implemented was also assessed. This varied from just defining policies to serious implementation (i.e., recording environmental data and using it for business optimization, along with conducting environmental management accounting and disclosing environmental data to the public). Nevertheless, it was found that EMA was moderately implemented among SMEs in Thailand. Furthermore, the study confirmed a positive relationship between awareness and the implementation of EMA. This implied that EMA practices can be encouraged and fostered by creating greater EMA awareness, especially in areas in which awareness or knowledge were lacking or limited.

Limitations and Suggestions for Future Studies

Last but not least, this study was limited to small- and medium-sized enterprises listed in the Market for Alternative Investment in Thailand. Together with the small sample size, this may limit the generalizability of the research findings to other settings. Another limitation of the research relates to the lack of depth of the information and insights captured by the questionnaire. Further, qualitative studies are highly encouraged, as these may provide better insights and identify key challenges why small and medium-sized enterprises, which are the backbone of the economy, could not fully implement environmental management accounting. Quantitative research with larger numbers of participants is also recommended, as this would increase the generalizability of the research findings.

References

Bennett, M., & James, P. (1998). *The green bottom line: Environmental accounting for management: Current practice and future trends.* Taylor & Francis.

Dinh, T. K., Nguyen, T. D., & Nguyen, T. H. (2022). Factor affecting an application of environmental management accounting in manufacturing enterprises in Vietnam. *Journal of Accounting, Finance and Auditing Studies*, *8*(3), 115–140. https://jafas.org/articles/2022-8-3/5_FULL_TEXT.pdf

Jalaludin, D., Sulaiman, M., & Ahmad, N. N. N. (2011). Understanding environmental management accounting (EMA) adoption: A new institutional sociology perspective. *Social Responsibility Journal*, *7*(4), 540–557. http://dx.doi.org/10.1108/17471111111175128

Jamil, C. Z., Mohamed, R., Muhammad, F., & Ali, A. (2015). Environmental management accounting practices in small medium manufacturing firms. *Procedia - Social and Behavioral Sciences*, *172*, 619–626. https://doi.org/10.1016/j.sbspro.2015.01.411

International Federation of Accountants. (2005). *International guidance document: Environmental management accounting*. https://www.ifac.org/knowledge-gateway/preparing-future-ready-professionals/publications/international-guidance-document-environmental-management-accounting

Klein, F., Grundmann, G., & Josten, F. (2022, September 14). *Sustainability in business: Staying ahead of the curve.* https://www2.deloitte.com/xe/en/insights/topics/strategy/sustainability-in-business-staying-ahead-of-the-curve.html

Li, X. (2004). Theory and practice of environmental management accounting: Experience of implementation in China. *International Journal of Technology Management and Sustainable Development*, *3*(1), 47–57. https://doi.org/10.1386/ijtm.3.1.47/0

Macpherson, A., & Wilson, A. (2003). Enhancing SMEs' capability: Opportunities in supply chain. *Journal of Small Business and Enterprise Development*, *10*(2), 167–179. https://doi.org/10.1108/14626000310473193

Manitsornsak, S. (2013). *Kān kamkap dūlǣ kitčhakān thī dī kap kān pœ̄tphœ̄i khọ̄mūn dān sangkhom læ singwǣtlọ̄m: kọ̄ranī sưksā bọ̄risat čhotthabīan nai talāt laksap ʻem ʻē ʻai (mai)* [Good governance and social and environmental disclosure: A case study from companies listed in the MAI] [Master's independent study, Thammasat University, Thailand]. https://digital.library.tu.ac.th/tu_dc/frontend/Info/item/dc:107427

Miller, K. (2020, December 8). *The triple bottom line: What it is and why it's important.* https://online.hbs.edu/blog/post/what-is-the-triple-bottom-line.

Mukwarami, S., Nkwaira, C., & Van der Poll, H.M. (2023). Environmental management accounting implementation challenges and supply chain management in emerging economies' manufacturing sector. *Sustainability*, *15*(2), 1061. https://doi.org/10.3390/su15021061

Nguyen, T. H. (2022). Factors affecting the implementation of environmental management accounting: A case study of pulp and paper manufacturing enterprises in Vietnam. *Cogent Business Management*, *9*(1), 2141089. https://doi.org/10.1080/23311975.2022.2141089

Setthasakko, W. (2010). Barriers to the development of environmental management accounting: An exploratory study of pulp and paper companies in Thailand. *EuroMed Journal of Business*, *5*, 315–331. https://doi.org/10.1108/14502191011080836

Tran, N. H., Hoang, T. H., & Nguyen, T. T. H. (2020). Environmental management accounting perception and implementation in the automotive industry in Vietnam. *Journal of Asian Finance, Economics and Business, 7*(12), 941–949. https://doi.org/10.13106/jafeb.2020.vol7.no12.941

United Nations (UN). (2023). *The sustainable development agenda*. https://www.un.org/sustainable development/development-agenda/

Vu, T. H. (2022). Factors affecting the implementation of environmental management accounting in manufacturing enterprises: Evidence from Vietnam. *Journal of Positive School Psychology*, *6*(10), 3289–3305. https://journalppw.com/index.php/jpsp/article/view/13870

Wahyuni, D. (2009). Environmental management accounting: Techniques and benefits. *Jurnal Akuntansi Universitas Jember*, *7*(1), 23–35. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1511390

Wilmshurst , T. D., & Frost, G. R. (2001). The role of accounting and the accountant in the environmental management system. *Business Strategy and the Environment*, *10*(3), 135–147. https://www.academia.edu/24547182/The_role_of_accounting_and_the_accountant_in_the_environmental_management_system