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Building Environmental Management Accounting in Shipping Industry

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Abstract

Sustainable development is an international issue of concern to the industry, including the shipping industry. The dense activity of the shipping industry makes the shipping industry one of the contributors to environmental pollution. Therefore, environmental accountability is one of the important aspects of corporate social responsibility to reduce the environmental damage caused by company activities. Environmental Management Accounting can improve environmental sustainability by evaluating information related to finance and the physical environment in the shipping industry. Coersive pressure, Green Shipping and Regulatory Pressure of the shipping industry are variables that in this study are considered to influence the adoption of Environmental Management Accounting. 120 questionnaires are distributed via WhatsApp, and as many as 100 questionnaires can be processed. The research data was analysed using Smart PLS. This study found that Coersive Pressure did not significantly affect EMA adoption in the shipping industry. In contrast, Green Shipping and Regulatory Pressure positively and significantly affected EMA adoption in the Shipping industry. The study concluded that Green Shipping and regulatory Pressure positively and significantly affected EMA adoption in the shipping Industry. In contrast, Coersive Pressure did not positively and significantly affect EMA Adoption.

Keywords: Environmental Management Accounting (EMA), Coersive Pressure, Green Shipping, Regulatory Pressure

1. INTRODUCTION

Environmental issues have become a serious concern in recent decades around the world. This is due to the increasing number of real threats to humans and the future, including natural disasters such as hurricanes, tsunamis, global warming and human-caused

disasters such as plastic waste, excessive use of non-renewable resources and oil spills in the oceans and polluted air (Rios et al., 2010).

The world community is committed to building sustainably by examining environmental problems. Sustainable development aims to end poverty, reduce inequality and protect the environment. Companies then consider social and environmental circumstances for their decision-making. Conventional and traditional accounting systems are considered to fail to provide environmental information in their financial accounting(Deegan, 2017) . Environmental Management Accounting (EMA) is to be carried out to overcome environmental information problems that have yet to be contained in various decision-making techniques and models(Gibassier & Alcouffe, 2018).

Shipping companies are also one of the companies that contribute to polluting the environment, and this is because environmental problems in the ocean due to global shipping are quite widespread, such as the global climate and its impact on human health; this causes the marine environment to be left behind in other industrial sectors (Poulsen et al., 2016). Trade volumes are increasing and causing the world's fleet to increase as companies want to benefit from economies of scale, raising concerns over the impact of shipping activities such as waste, noise pollution, G.R. and toxic materials (Wu et al., 2016).

Major international maritime industries are important in global sustainability(Benamara, H., Hoffmann, J., & Youssef, 2019). To answer environmental problems and control the amount of pollutants from shipping activities both above and below sea level, the International Convention for the Prevention of Pollution From Ships (MARPOL) and the International Maritime Organization (IMO) regulate cruise ship companies to reduce the amount of air and water pollution from their operations. IMO (IMO, 2017).

Environmental Management Accounting (EMA) provides environmental information (monetary and physical) with the aim of increasing the efficiency of natural resources and reducing environmental impacts (Saeidi,S,P. and Othman, M, S, 2017) . The environmental management accounting system is a corrective innovation to overcome the limitations of conventional management accounting systems that still need to provide correct information about environment-related costs(Hossain, 2019). Environmental Management Accounting System helps companies better manage environmental problems and improve the way companies treat the environment (Asiri et al., 2020). The development of environmental accounting is an empirical concern in developing countries involving various industries, one of which is the industry that also contributes to environmental pollution the shipping

industry, because of their business activities. This study aims to examine the perception of adopting Environmental management accounting systems in shipping companies in Samarinda City; this is related to the large number of shipping companies in Samarinda City and the dense shipping activities on the Mahakam River. This study also empirically examines whether Coersive pressure variables, Green Shipping variables, and IMO regulatory pressures governing pollution significantly affect the adoption of Environmental management accounting systems in shipping companies to support sustainable development in Samarinda.

2. LITERATURE REVIEW

2.1 Environmental Management Accounting

Conventional management accounting systems have cognitive limitations related to environmental information and only emphasise the perspective of profitability. Conventional management accounting systems generally recognise environmental costs as indirect costs of products or services so that they are invisible and considered to ignore environmental information (Nyahuna & Doorasamy, 2022). The environmental management accounting system is an extension of the conventional management accounting system, which can be defined as the identification of allocation, creation and use of physical and monetary information to assist business decision-making in encouraging sustainable business development.(Fuadah et al., 2021)(Phan et al., 2017) (Mokhtar et al., 2016).

Companies can measure environmental financial and non-financial information that breaks environmental costs into overhead costs by adopting environmental management accounting (Nyahuna & Doorasamy, 2022). The burden of environmental regulation and improving the organisation's image from an environmental perspective can be reduced by adopting environmental management accounting (Christ & Burritt, 2013b); (Johnstone, 2018). EMA can be divided into two areas, the first monetary aspect of EMA and the second physical aspect of EMA. The monetary aspect of the EMA is based on the company's activities related to environmental impact and can be expressed in monetary units. This monetary unit provides useful information for management for decision-making. The physical aspects of EMA are based on natural environmental information expressed in physical units(Burritt et al., 2002).

2.2 Institutional Pressures on Environmental Management Accounting Adoption

According to institutional theory, firms are widely influenced by the external environment, actions and behaviours such as laws and regulations, values, norms, and culture and expectations (DiMaggio & Powell, 1983);(Heugens & Lander, 2009) Institutional pressure aims to influence organisational behaviour to adopt ideas that are carried out, among others, Coersive, mimetic, and normative(DiMaggio & Powell, 1983). Institutional pressures come from formal rules (Rules and mandates) and informal constraints (norms, conventions and beliefs), as well as the way organisations respond to pressures to determine their institutional legitimacy. Companies are affected by changes in the external environment and must adapt to changes to ensure sustainability(DiMaggio & Powell, 1983). Coersive pressure arises when stakeholders impose powerful forces such as rules, regulations, sanctions and penalties. In comparison, normative pressure arises from value expectations, norms, corporate standards, and culture (ABDULAZIZ et al., 2017).

2.3 Coersive Pressure and Environmental Management Accounting

Based on institutional theory, Coersive pressure is able to shape environmental protection and organisational legislative mandates (Berrone et al., 2013). According to institutional theory, Coersive pressure is primarily concerned with multifactor complexity, such as internal behaviour (Roxas & Coetzer, 2012) . Coersive pressure is used to force companies to implement different environmental regulations and standards commonly imposed by external stakeholders, such as government authorities and nongovernmental organisations (Roxas & Coetzer, 2012). In the application of environmental management accounting, Coersive pressure plays an important role because it is found that the coercion of this pressure will affect the company's environmental performance(Latan et al., 2018). Applying environmental management accounting will help companies improve environmental performance in the face of Coersive pressures to get government support and economic benefits. Applying environmental management accounting helps companies build their social reputation (Berrone et al., 2013).

Hypothesis 1 : There is a positive relationship between Coersive pressure and EMA adoption

2.4 Green Shipping And Environmental Management Accounting

Maritime operations' pollution, including liquid and solid sediments, impacts ports and the surrounding environment (Helfre, J.-F., Boot, 2013). Green Shipping is a collection of

efficiency measures implemented in shipping operations (Felício et al., 2021);(Shi et al., 2018). The environmental consequences of routine operations or accidents involving initiatives spur the maritime industry to improve environmental management systems (Sharma et al., 2021). Environmental consequences such as air pollution (SOx, NOx), water pollution (oil spills, water ballasts), and waste products are some examples of how green shipping uses technical innovation to protect the environment, promote ecopreneurship, and sustain trade (Zhang et al., 2019).

Sea transport in Europe poses environmental impacts that concern government agencies and citizens. European and global regulations are driving attention to reducing the impact of toxic gases in air pollution, improving engine performance to reduce emissions, encouraging ships to use power in ports and using new fuels such as natural gas or hydrogen. Other activities reduce the amount of pollution in the sea by storing waste on board and then disposing of it in ports, recycling ship materials by creating an ecological network of ship demolition and implementing environmental practices at the construction stage (Walker et al., 2019). Routine operations at the port cause environmental impacts; it is found that water pollution occurs from ballast water, diesel waste and cargo residues (Shi et al., 2018).

Hypothesis 2: There is a positive relationship between Green Shipping and EMA adoption

2.5 Regulatory Pressure (IMO Regulation)

The adverse environmental impacts of shipping operations have raised public concerns leading to significant improvements in environmental regulations, laws, actions and directives and other forms around the world (Abadie et al., 2017). For shipping companies to pay more attention to environmental impacts, public concerns are reinforced by the government and community representative bodies such as IMO and Government Regulations. The International Maritime Organization (IMO) contained in the Prevention of Pollution from Ships (MARPOL) guides waste generated by ships and regulates this type of pollution (Walker, T.R.; Adebambo, O.; Del, 2018);(Cariou et al., 2019). Environmental regulations of the International Maritime Organization are developing gradually, and the IMO Convention regulates the construction of ships to reduce greenhouse gas (GHG) emissions by about 15% to 20% by 2020 and 30% by 2025. In addition, IMO has also approved regulations in the Assembly of the marine environment protection committee (MEPC) on internal GHG regulations and revision of Marine Pollution (MARPOL) to reduce

carbon dioxide (CO2) emissions from ships by 2030 at the 2012 MEPC general meeting (Kim, 2015)

Regulatory pressure is being extended by the IMO on the shipping industry, with European countries requiring companies to adhere to environmental sustainability targets to reduce sulfur and CO2 emissions and water pollution from ships, for example using cleaner scrubbers and ballast water treatment systems on board. ship (Yang et.al., 2013). Regulasi IMO digunakan untuk memperkuat legitimasi dan menghindari finalty bagi perusahaan sehingga menekan perusahaan untuk melakukan Green Practice dan Green Innovation (Lisi et al., 2020).

Hypothesis 3 : There is a positive relationship between Regulatory Pressure and EMA adoption

3. RESEARCH METHOD

The conceptual framework in this study is to examine the relationship between Coersive Pressure, Green Shipping and Regulatory Pressure on EMA Adoption in the Shipping Industry, which can be seen in the model

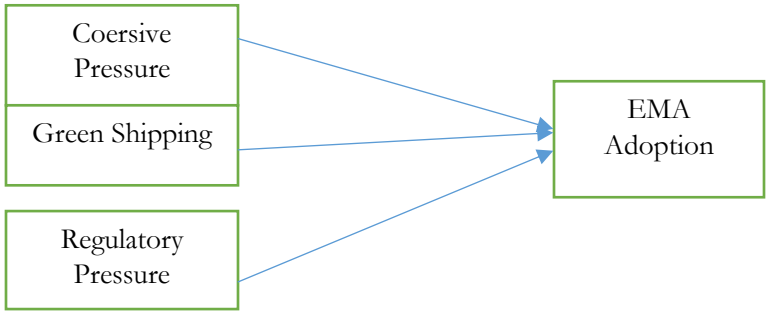

Figure 1: Research Conceptual Framework

This study used a quantitative approach that used descriptive analysis and hypothesis testing. The population in this study is shipping companies in the city of Samarinda. This company was chosen because liquid and solid sediments from shipping operations cause pollution that impacts the port and its surroundings (Helfre, J.-F.; Boot, 2013). The city of Samarinda, surrounded by the Mahakam River and the dense shipping activities and many

shipping companies, is the reason for this study. The sampling technique is suitable, according to Sekaran and Bougie by using the easiest and less complex sampling technique (Sekaran & Bougie, 2016). Respondents in this study are the financial department of shipping companies sending online questionnaires to respondents to represent one shipping company. These respondents are considered to have relevant knowledge regarding environmental accounting information, IMO regulations and Green Shipping which are currently also applied to the shipping industry and the company's sustainability. Of the 120 questionnaires distributed to shipping companies, 100 received responses from respondents. This study uses descriptive analysis to analyse and test hypotheses using the SEM-PLS Modeling equation.

3.1 Variable Measurement

The variables of the study were measured on a Likert scale of 5. Institutional pressure variables are measured by questions adapted from research (Colwell & Joshi, 2013) ; (Roxas & Coetzer, 2012); ;(Daddi et al., 2016) ;(Wang et al., 2020). The institutional pressures discussed in this study take Coersive pressures exerted by external stakeholders such as government authorities and non-governmental organisations that require companies to implement different environmental regulations and standards (Roxas & Coetzer, 2012). Questions on EMA Adoption Variables adapted based on research(Ferreira et al., 2010) ;(Christ & Burritt, 2013a);(Phan et al., 2017). The adoption of Environmental Management Accounting is expected to improve the company's image from an environmental perspective (Christ & Burritt, 2013a);(Johnstone, 2018). Environmental Management Accounting contains environmental information about environmental impacts and improving the company's environmental performance (Jasch, 2003). The Green Shipping variable question is adapted from Felicio's (2021) research in which there are various steps to reduce pollution from shipping activities caused by shipping activities which will have an impact on the financing side of the shipping industry, while the Regulatory Pressure question is adapted from research (Yang, 2018) ; (Zhu, Q., Sarkis, J., Lai, 2013) in which there are environmental rules from IMO, rules from the E.U. regarding sulphur and national environmental regulations in the shipping industry.

Table 1. Research Instruments

Variable	Operationalisation	Adapted From
Coersive Pressure	1. Our company tries to reduce environmental threats through environmental management accounting. 2. There are penalties for companies that violate environmental standards.	(Colwell & Joshi, 2013);
Green Shipping	1. a ship equipped with environmental technologies 2. Separation of waste on board 3. fuel consumption in travel 4. traffic congestions at the port 5. Water pollution with ballast	(Felicio, 2021)
Regulatory Pressure	1. The IMO's environmental conventions, directives and regulations (e.g Marpol). 2. The E.U.'s environmental	(Yang, 2018);(Zhu et.al, 2013)

	conventions, directives and Regulations (e.g EU Shulpur Directive)	
Environmental Management Accounting	1. Our firm's accounting system records all physical inputs and outputs (such as energy, water, materials, wastes, and emissions); 2. Our firm's accounting system can identify, estimate and classify environmental-related costs and liabilities; 3. Our firm's accounting system can create and use environmental-related cost accounts; 4. Our firm's accounting system can allocate environmental-related costs to products.	(Ferreira et.al, 2010);(Chirst & Burrit, 2013);(Phan et.al, 2017)

3.2 Data Analysis and Variable Measurement

The structural equation model (SEM) used in this study is a second-generation multivariate analysis technique used to test relationships between constructs. SEM-PLS is

used for data analysis (Ringle, 2014). SEM-PLS examines the collected data and looks at the relationship between hypotheses, and there is measurement model analysis and structural model analysis. Reliability and validity are data measurement models. Data measurement using several tools: Cronbach's alpha, average variance extracted and Composite reliability. Meanwhile, to determine the validity of the model, namely by Cross loading and factor loading (Henseler et al., 2015). Structural models also test the significance level of the hypothesis with path coefficients (Henseler et al., 2015);(Hair Jr et al., 2017);(Nitzl & Chin, 2017).

Measurement models test the fit between theory and data and the relationship between observed and unobserved variables. The measurement value determines each construct's reliability and validity because the construct's reliability and validity represent the nature of the relationship and the conceptual framework. (Henseler et al., 2015) The measurement models used in SEM PLS are reflective and formative measurements (Henseler et al., 2015). Based on previous research, reflective measurements describe observed variables as dependent variables and can replace each other. In contrast, formative measurements describe observed variables triggered by latent variables that can be adequately explained by theory (Gefen et al., 2000). There are four measurement model measures: internal consistency (composite reliability), indicator reliability, convergent validity and discriminant validity (Gefen, 2000). Test reliability is assessed by alpha, compound reliability and the average variance extracted (AVE) from Cronbach's alpha. The average variance extracted (AVE), defined as the average value of the magnitude of the squared load and equivalent to the commonality of a data reliability construct, is assessed through the values of Cronbach alpha, composite reliability and AVE (Henseler et al., 2015). Construction is considered reliable if the respective values are as follows: Cronbach $\alpha \geq 0.70$, composite reliability ≥ 0.70 and AVE ≥ 0.50 (Hair et al., 2014). Factor loadings and cross-loadings are used to test data validity at the indicator level (Henseler et al., 2015). The indicator is considered valid when the loading factor value is≥ 0.60 (Hair Jr et al., 2017)

4. RESULT

To examine the validity and reliability of the data in this survey, several steps are used, among others, considering previous research following this study and testing questionnaires in this study. The questionnaire of this study was tested on five shipping companies in Samarinda. SEM PLS was used in this study, as it was considered suitable for building theories. The steps taken are to evaluate the measurement model by testing

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reliability by considering the Cronbach alpha value and reliability testing by considering the reliability value of internal consistency and reliability to test outer loadings.

The indicator is reliable if the outer loadings are at least 0.60. In general, the accepted outer loadings are 0.60-0.70, which indicates an acceptable level of reliability (Hair et al., 2017); if the outer loading is less than required, it is considered to remove indicators that increase Composite reliability or average variance extracted (AVE). Items from Green Shipping (GS1), Coersive Pressure (CP2) were excluded from the initial measurement model because it does not fit the criteria.

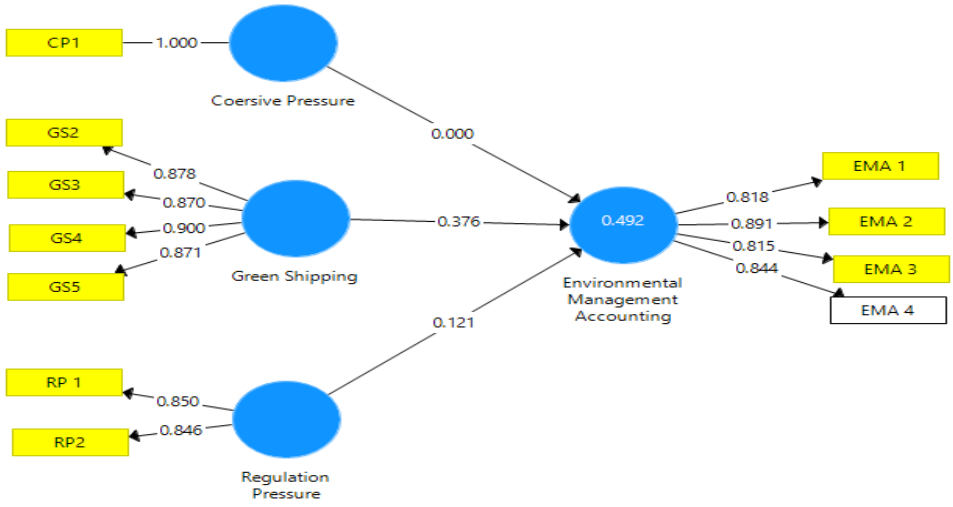

Figure 2: The Modified Measurement Model

Consistency of results delivered in a test to ensure that various items are measured of different constructions and provide a consistent score measured using Composite reliability (C.R.). In this study, Composite Reliability has a value of more than the threshold of 0.70, so that it shows that the construct achieves internal consistency reliability.

Table 2. Convergent Validity and Reliability of the measurement model

Latent Construct	Label	Cronbach Alpha	Rho A	Composite Reliability	AVE
Coersive Pressure	CP1	1.000	1.000	1.000	1.000
Green Shipping	GS2 GS3 GS4 GS5	0,864	0,872	0,907	0,710
Regulatory Pressure	R.P. 1 RP2	0,903	0,906	0,932	0,774
Environmental Management Accounting	EMA1 EMA2 EMA3 EMA4	0,710	0,710	0,837	0,719

Discriminant validity is the extent to which a construct is distinct from other constructs by empirical standards. Discriminant validity was assessed using the Heterotrait-Monotrait Ratio of Correlations (HTMT) (Hair et al., 2014).

Table 3. Result of discriminant validity testing

Latent Construct	Coersive Pressure	Environmental Management Accounting	Green Shipping	Regulation Pressure
Coersive Pressure				
Environmental Management Accounting	0.238	0.842		
Green Shippung	0.258	0.652	0.880	
Regulation Pressure	0.361	0.547	0.495	0.848

Measurement of the structural or inner model shows direct and indirect relationships between exogenous and endogenous latent variables.

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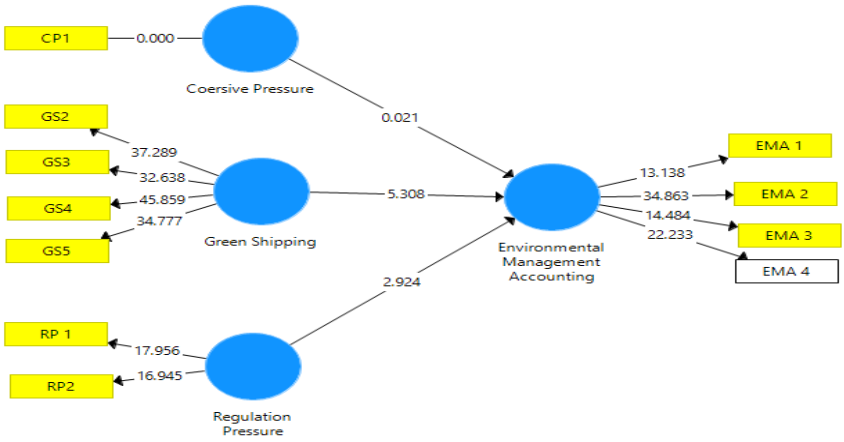

Figure 3: Structural Model

Furthermore, the SEM-PLS bootstrap procedure was carried out to test the hypothesis using path analysis, as shown in Figure 2 and in Table 4, which showed that Coersive Pressure did not have a positive and significant effect on EMA Adoption. In contrast, Green Shipping and Regulatory Pressure positively and significantly affected EMA adoption.

Table 4. Result of the structural model

Hypothesis	Original samples (O)	Sample Mean	Standard Deviation (STDEV)	T Statistics	P Values	Result
Coersive Pressure→EMA	-0.002	-0.002	0.075	0.020	0.984	Not Supported
Green Shipping→EMA	0.506	0.506	0.047	4.637	0.000	Supported
Regulation Pressure→EMA	0.297	0.302	0.108	2.747	0.006	Supported

5. DISCUSSION

The study tested three hypotheses. Based on table 4, it was found that Coersive pressure did not have a significant effect on EMA adoption in shipping companies in Samarinda. This finding is inconsistent with the findings of previous studies (Latif et al., 2020). Green shipping has a significant positive influence on EMA adoption, so hypothesis 2 is accepted, and Regulation pressure has a significant positive influence on EMA adoption, so hypothesis 3 is accepted

The findings in this study found that Coersive pressure did not have a positive and significant effect on the adoption of Environmental Management Accounting in the shipping industry; this study is different from the results of previous studies, which found that Coersive pressure derived from regulatory standards designed by the government influenced the adoption of Environmental Management Accounting in companies. However, this study found that Green Shipping has a positive and significant effect on the adoption of Environmental Performance in the shipping industry; some previous studies have emphasised this (Farrell, 2003); (Cofala et al., 2007); (Montabon et al., 2007). Environmental issues and rising costs of environmental protection to achieve sustainable development and create competitiveness. Ships are a major source of pollution in cities surrounded by harbours. Hence, environmental issues are paramount (Farrell, 2003), but there is no evidence that the benefits outweigh the costs of environmental protection initiatives.

However, it is possible to improve business performance and reduce negative effects by using environmental management (Lun et al., 2014). Research (Felicio, J.A, Rodrigues R., 2021). shows that Green Shipping affects sustainable economies based on ship economies of scale, fleet growth and increased productivity and environmental performance based on environmental quality and environmental protection. This study also found that Regulatory Pressure in which environmental regulations based on IMO and E.U. (sulphur rate rules) in the shipping industry affect the adoption of Environmental Management Accounting in the shipping industry. This is because the shipping industry must comply with various rules regulated nationally and internationally that must be obeyed by the shipping industry and have an economic impact on the shipping industry so that the adoption of Environmental Management Accounting can calculate the costs that the shipping industry must bear.

6. COUNCLUSION

Due to the increasing awareness of the world community on world sustainability, Environmental Management Accounting has become an effective tool to overcome

environmental impacts and reduce the impact of environmental practices in the shipping industry. The results show various implications for practitioners and policymakers for adopting Environmental Management Accounting in the shipping industry by considering various rules that will not harm the shipping industry in terms of financing charged for various national and international regulations that must be complied with by the shipping industry.

This study has certain limitations. First, the data of this study is based on cross-sectional data; data collection in this study is based on the causal relationship between independent and dependent variables. This study's causal relationship data may not fully represent the proposed model. The two respondents selected in this study are Accounting and operational managers in the shipping industry in Samarinda City so this individual perception cannot represent the perception of the shipping industry as a whole to adopt Environmental Management Accounting.

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