



# EIDWT 2023

## THE 11-TH INTERNASIONAL CONFERENCE ON EMERGING INTERNET, DATA & WEB TECHNOLOGIES (EIDWT-2023)

February 23-25, 2023  
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Semarang, Indonesia

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### AIMS AND SCOPS

The 11-th International Conference on Emerging Internet, Data and Web Technologies (EIDWT-2023) is dedicated to the dissemination of original contributions that are related to the theories, practices and concepts of emerging Internet, Data and Web technologies yet most importantly of their applicability in business and academia towards a collective intelligence approach. EIDWT-2023 will discuss advances in information networking bring various internetworking and emerging data technologies together to capture, integrate, analyze, mine and visualize data and made available from various community users. The EIDWT-2023 provides a forum for original discussion and prompt future directions in the area. The main topic areas include, but are not limited to:

- Internet Protocols, Modelling and Optimization
- Network and Data Security, Trust and Reputation
- Big Data and Cloud Computing
- Mobile and Wireless Networks
- P2P and Grid Computing
- Distributed and Parallel Systems
- Ontologies and Metadata Representation
- Knowledge Discovery and Mining
- Databases and Data Warehouses
- Data Centers and IT Virtualization Technologies
- Web Science and Business Intelligence
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Lecture Notes on Data Engineering  
and Communications Technologies 161



Leonard Barolli *Editor*

# Advances in Internet, Data & Web Technologies

The 11th International Conference  
on Emerging Internet, Data & Web  
Technologies (EIDWT-2023)

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# **Lecture Notes on Data Engineering and Communications Technologies**

**161**

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Leonard Barolli  
Editor

# Advances in Internet, Data & Web Technologies

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# **Welcome Message of EIDWT-2023 International Conference Organizers**

Welcome to the 11th International Conference on Emerging Internet, Data and Web Technologies (EIDWT-2023), which will be held from February 23 to February 25, 2023.

The EIDWT is dedicated to the dissemination of original contributions that are related to the theories, practices and concepts of emerging Internet and data technologies yet most importantly of their applicability in business and academia toward a collective intelligence approach.

In EIDWT-2023, topics related to Information Networking, Data Centers, Data Grids, Clouds, Crowds, Mashups, Social Networks, Security Issues and other Web implementations toward a collaborative and collective intelligence approach leading to advancements of virtual organizations and their user communities will be discussed. This is because Web implementations will store and continuously produce a vast amount of data, which if combined and analyzed through a collective intelligence manner will make a difference in the organizational settings and their user communities. Thus, the scope of EIDWT-2023 includes methods and practices which bring various emerging Internet and data technologies together to capture, integrate, analyze, mine, annotate and visualize data in a meaningful and collaborative manner. Finally, EIDWT-2023 aims to provide a forum for original discussion and prompt future directions in the area.

An international conference requires the support and help of many people. A lot of people have helped and worked hard for a successful EIDWT-2023 technical program and conference proceedings. First, we would like to thank all authors for submitting their papers. We are indebted to Program Area Chairs, Program Committee Members and Reviewers who carried out the most difficult work of carefully evaluating the submitted papers. We would like to give our special thanks to Honorary Chair of EIDWT-2023 Prof. Makoto Takizawa, Hosei University, Japan, for his guidance and support. We would like to express our appreciation to our Keynote Speakers for accepting our invitation and delivering very interesting keynotes at the conference.

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# **EIDWT-2023 Keynote Talks**

# Fueling the Data Engine to Boost the Power of Analytics

Wenny Rahayu

La Trobe University, Melbourne, Australia

**Abstract.** Data analytics is often considered in isolation. The attractiveness of the problems that need to be solved, the sophistication of the solutions, and the usefulness of the results are certainly the significant strengths of work on data analytics. However, the input data is often too simplistic, or at least the assumption that the data is already readily prepared for data analytics often neglects the fact that preparing such an input data is in many cases, if not all, actually the major work in the data life cycle. The pipeline from the operational databases that keep the transactions and raw data to the input data for data analytics is very long; it often occupies as much as 80% (or sometimes even more) of the entire life cycle. Therefore, we need to put much effort to this preparation and transformation work in order to value the work and the results produced by data analytics algorithms. Having the correct input data for the data analytics algorithms, or in fact for any algorithms and processes, is critical, as the famous quote “garbage in garbage out” had said. Even when the original data is correct, but when it is presented inaccurately to a data analytics algorithm, it may consequently produce incorrect reasoning. This talk will present a systematic approach to build a data engine for effective analytics.

# Impact of Uncertainty Analysis and Feature Selection on Data Science

Ricardo Rodriguez Jorge

Jan Evangelista Purkyně University, Ústí nad Labem, Czech Republic

**Abstract.** Data science applications usually need a previous preprocessing stage for feature extraction and data validation. The data needs to be preprocessed and analyzed to minimize the dataset while preserving variance and patterns in order to find the optimal feature vector configuration. The feature selection algorithm allows finding the feature vector configuration to ensure minimal uncertainty in mapping the corresponding outputs and feature vectors. In data science, feature vector designs can be performed by different techniques and the validation can be performed by uncertainty analysis. These considerations are timely because wearable devices are increasingly being used on a large scale in different scientific fields. This talk will contribute to recommendations for the use of signals and data as a means of informing the impact of different uncertainty analysis and feature selection methods for data science applications. Using this new knowledge together with machine learning, data science applications can be evaluated with more confidence.

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# Conceptual Paper of Environmental Disclosure and Financial Performance: The Role of Environmental Performance

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**Abstract.** This research examines the company's environmental responsibility in responding to current environmental issues. The regulations from stakeholders and the increasing public awareness of pollution are new challenges for companies. Therefore, companies must increase their environmental responsibility and pay more attention to their business activities. This research aims to identify the role of environmental disclosure on the company's financial and environmental performance. In addition, this study also observes the role of environmental performance in affecting environmental disclosure and financial performance. This research used an exploratory quantitative approach. The population was large companies listed on the Indonesia Stock Exchange (IDX) from 2006–2020. The method used purposive sampling with secondary data. This research is still in the form of a conceptual paper. Therefore, further research is needed to increase the company's knowledge and competence to respond to environmental issues.

**Keywords:** Environmental disclosure · Environmental performance · Financial performance

## 1 Introduction

Global warming has been one of the central issues of the world since the end of the twentieth century. The United Nations Framework Convention on Climate Change (United Nations Conference Declaration on the Human Environment, 1992, p. 3) defines global warming as “a climate change which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere [1]. Another issue related to the environment is the preservation of the environment and natural resources. Environmental issues are growing rapidly. The initial concerns were pollution, wilderness conservation, population growth, and depletion of natural resources. These concerns have merged with energy supply, biodiversity, species extinction, climate change, and other disturbances to the Earth's systems [2]. United Nations Framework Convention on Climate Change

(1972) states that “Earth’s natural resources, including water, water, soil, flora and fauna and especially representative samples of natural ecosystems, must be protected appropriately for the benefit of present and future generations through careful planning or management. Environmental issues continue to be in the spotlight and current discussion. In the business world, there is an increase in business in terms of environmental management and preservation [3].

To overcome climate change, stakeholders such as governments, international associations, and other related stakeholders immediately require companies’ involvement in preserving the environment through rules and regulations [4]. These issues will affect the company in conducting its daily operations, at the same time, society will also become more sensitive to the pollution caused by the company [5]. As a result of getting much pressure from its stakeholders, the private industry needs to be responsible for the impact of its business activities on the community. Along with environmental damage and more serious environmental problems, stakeholders are paying attention to the company’s environmental responsibility [6, 7].

Environmental disclosures should cover key environmental issues and their impact on the company’s future performance and position, risks and uncertainties, and policies on significant environmental issues such as emissions trade [8]. Organizations must report emissions trading schemes and include greenhouse gas emission reports for direct emission calculations, such as combustion of fuel in boilers, and indirect emissions such as waste disposal, disclosure of energy expenditures, and direct energy reporting, e.g., oil and coal. Moreover, the indirect energies are electricity purchases, reporting the amount of water taken, reporting the amount of waste, reporting on water use policies, and more. They should also explain how environmental damage can affect tangible and intangible assets [9].

Environmental performance is an essential topic to discuss due to climate change, global warming, and environmental damage caused by the production process. It creates many changes in manufacturing technology to understand environmental care or environmental awareness [10]. Businesses depend on natural and human resources. When managers struggle to compete in a global economy, they must perform within social constraints characterized by increasing environmental accountability. This accountability includes high public scrutiny of a company’s environmental performance and its public performance disclosure. The elements of corporate environmental accountability affect the company’s profitability [5]. Research on environmental disclosure, environmental performance, and financial performance by [5] found a positive relationship between environmental performance and financial performance and a relationship between environmental disclosure and environmental performance.

Legitimacy also certainly affects the company in a way that makes them strive to optimize its environmental performance and disclose its environment. Therefore, companies are required to voluntarily report activities if management believes that these activities are expected by the communities where they operate [11]. Research from [12] also emphasised that corporate social disclosure is motivated by the company’s necessity to legitimize its activities. In other words, environmental performance and environmental disclosure are very important for companies to gain, maintain, and enhance their legitimacy status in front of stakeholders. Based on legitimacy theory, companies apply

environmental practices related to environmental performance, financial performance, and environmental disclosure. The higher the financial performance of the company, the more environmental disclosure will be released if good environmental performance strengthens it.

Research from [13] stated that environmental disclosure affects how the environmental performance and its impact will be a company risk. According to [14], companies can gain legitimacy by providing environmental disclosures. In addition, participating in external environmental performance assessments is another way for companies to gain legitimacy. The premise is that companies with an adequate level of environmental disclosure have more opportunities and may have a tendency to raise higher environmental performance. Several studies found a positive correlation between environmental performance and the environmental disclosure [1]. While others show a negative correlation [4].

Previous studies have shown many results on the relationship between a company's financial performance and the level of environmental disclosure. Larger companies tend to provide more comprehensive information about their environmental activities and are more visible to their external audiences and stakeholders [15]. Therefore, large companies can improve their reputation by communicating their environmental disclosures to the public [14].

Research from [16] explained that companies with high environmental performance are determined to maintain investors and other stakeholders through more voluntary environmental disclosures compared to companies with lower environmental performance. From these findings, financial and environmental performance are the key factors that determine the extent of environmental disclosure.

This research provides an integrated analysis of the overall management strategy that affects (1) environmental disclosure, (2) environmental performance, and (3) financial performance. Environmental accounting has an important role in the financial performance of a company. Financial performance is presented in the form of financial variables that will be associated with environmental performance variables and environmental disclosures. Meanwhile, environmental performance is presented in the form of environmental variables which will be associated with environmental disclosure variables and financial performance. The environmental disclosure variables will be associated with the financial performance variables and intervening variables in environmental influences of financial performance.

This research differs from previous research in several dimensions. The difference is located in the data and variable measurement, which examine the relationship between the variables used. This difference strengthens previous research, which only tested the relationship between variables because it tested the effect and added that the intervening variable used in this research was environmental performance. It is expected to add insight to report users. The contribution of this research is expected to be helpful for the company and to increase its awareness of environmental management, which has only focused on the company's short-term profits, regardless of the environmental damage that will occur. The findings of this research are expected to assist in the decision-making process related to environmental disclosure initiated by companies, investors, and regulators. Furthermore, our results are expected to enrich knowledge related to

environmental disclosure. This research also attempts to answer the following research questions:

RQ1. How does environmental disclosure affect financial performance?

RQ2. How does environmental disclosure affect environmental performance?

RQ3. How does environmental performance affect the relationship between environmental disclosure and financial performance?

Based on the description above, the researchers are interested in conducting this research because of the differences in the results from previous studies. The researcher also measured the effect of environmental disclosure on financial performance and wanted to identify how environmental performance can mediate the impact of environmental disclosure on financial performance.

## 2 Literature Review

### Legitimacy Theory

Legitimacy theory is based on “the general perception or assumption that the actions of an entity are desirable, appropriate, or conforms in some socially constructed system of norms, values, beliefs, and definitions” [12]. Based on the legitimacy theory perspective, companies prefer to disclose more environmental information to gain legitimacy [17]. Investors are more likely to buy company stock that discloses more environmental information due to the low legitimacy risk and high transparency of environmental information. According to the legitimacy theory of Dowling and Pfeffer (1975), corporate social disclosure is one of the ways companies respond to political and public pressures and corporate activities must be fully in line with the goals of the general public. Legitimacy is essential because it affects not only how stakeholders perceive and understand a company but also how they react to the organization of the company. If a company’s corporate activities deviate from socially recognized values, social legitimacy will be threatened. On the other hand, the legitimacy theory [2] proposed that corporate environmental disclosure and social information are a function of social and political pressures. Companies are becoming more concerned about disclosing information as they face more social and political pressures. Therefore, the theory explains that companies with poor environmental performance face more public pressure. In such a scenario, actors tend to make greater and more positive disclosures of environmental information to avoid the threat of bad legitimacy. This means that environmental disclosure and performance are very important for companies to gain, maintain and enhance their legitimacy status in front of stakeholders. Based on legitimacy theory, companies apply environmental practices related to environmental performance, financial performance, and environmental disclosure. Lindblom (1994) in [11] shows that companies adopt one of three disclosure strategies to legitimize their actions. Companies may try to: (1) inform the public; (2) change their perception; or (3) distract stakeholders from their corporate actions.



### 3 Hypothesis Development

#### **Environmental Disclosure and Financial Performance**

Companies require to do activities that can be used to demonstrate their responsibilities to stakeholders, one of them is by providing environmental disclosures [13]. Building a relationship between environmental disclosure and environmental performance is important from a social responsibility perspective in a positive relationship [5]. Environmental disclosure leads to an asymmetry reduction of information between the company and external stakeholders, which enhances the reputation and brand firm value, enabling it to obtain more financing opportunities, reducing costs financing and increasing its value [15]. The company must disclose environmental information in accordance with guidelines that can limit behaviour-selective corporate disclosure (greenwashing) and ensure objective and fair disclosure of information [5].

Companies are forced to increase their environmental spending and invest limited resources in environmental protection, though they can improve environmental performance rather than growth in the financial performance [18]. Companies with environmentally responsible practices are more likely to generate positive perceptions from stakeholders, leading to superior financial performance [19]. Environmental disclosure is a company's medium to describe its environmental performance, so the existence of this disclosure is an important factor in ensuring the sustainability of the company's environmental performance program [7]. Companies that disclose more information have better stock liquidity, reduce transaction and capital costs, and improve financial performance [20]. Companies that disclose their environmental policies signify transparency and reduce the risk of uncertainty and competitive advantage. Meanwhile, companies that disclose fewer items show various risks, such as the risk of litigation, penalties for pollution, future environmental costs and low future cash flows [9]. [21] explained that companies will benefit economically from preparing the expanded social and environmental disclosures in the form of higher stock prices.

Companies with high levels of profitability tend to present high environmental disclosures because profitable companies tend to have more resources to make environmental disclosures. Ownership of large resources can be used to show the company's contribution to the environment to reduce social pressure from the community and give a positive impression to stakeholders [22]. When companies realize that environmental information disclosure is positively related to financial performance, they will be more likely to increase the level of environmental information disclosure. Companies with high profits are able to allocate their expenses to many aspects, including involvement in social activities. A high level of profitability leads to more social disclosure [1]. Measurement of a company's environmental aspects, such as the amount of waste or greenhouse emissions, tends to significantly increase a company's spending. Environmental disclosure also requires high tangible costs, including the costs of establishing systems, and identifying, measuring, and reporting information. Therefore, only profitable companies can afford the costs [21].

H1: Environmental Disclosure has a positive effect on Financial Performance.

### **Environmental Disclosure and Environmental Performance**

The voluntary disclosure literature shows that companies tend to report good news, while they are discouraged from disclosing bad news [9]. Indeed, these companies use earnings management or income smoothing to reduce the adverse effects of bad news. Voluntary environmental disclosures include reporting information about financial capabilities, environmentally sensitive operations, shareholder ownership, previous environmental law involvement, media exposure, environmental concerns and risks, and previous involvement with environmental groups.

Companies with high levels of environmental performance due to a proactive environmental strategy have incentives to disclose more environmental information voluntarily to investors and other stakeholders [23]. Companies that are environmentally sensitive and adopt healthy environmental policies will be motivated to provide voluntary environmental disclosures to inform investors about their global environmental strategy [24]. According to [5], companies with good environmental performance should disclose more environmental information (in quantity and quality) than companies with poor environmental performance.

Companies that provide voluntary environmental disclosures tend to use practices that are less harmful to the environment. Empirical studies from [11] found a positive and statistically significant relationship between the disclosures of environmental accounting information and environmental performance. They stated that the better the environmental performance, the higher the quality of environmental disclosure. The authors found that disclosure of environmental information had a positive and statistically significant impact on environmental performance. Legitimacy theory [25] proposes that the disclosure of corporate environmental and social information is a function of social and political pressures. As companies face more social and political pressures, they become more concerned about disclosing information. The theory explains that companies with poor environmental performance face more public pressure. In such a scenario, bad actors will tend to make greater and more positive disclosures of environmental information to offset the threat to legitimacy.

H2: Environmental disclosure has a positive effect on environmental performance.

### **Environmental Performance and Financial Performance**

Many companies are implementing environmental activities to improve environmental performance. Companies should engage in environmental activities to generate capability development, which can have a positive impact on reducing costs and improving reputation [26]. Proactive environmental companies are no longer asking how much environmental activities cost but how much benefit they will provide [27].

Implementing environmental activities to achieve better environmental performance depends on a favourable cost-benefit relationship. Whilst, companies should have incentives to implement environmental activities proactively only if the associated (expected) benefits outweigh the costs. Research according to [28] stated that more companies have voluntarily published environmental information because top managers, generally believe that positive environmental concerns can increase stakeholder tendencies

in investment decisions. It also proves that environmental trends can improve financial performance. In research on environmental and financial performance, [19] found a positive effect of environmental performance on financial performance, because companies with excellent environmental performance tend to get positive responses from their stakeholders, resulting in sustainable profit growth.

According to [29], stated that the application of environmental management practices to improve environmental performance not only generates business opportunities, but also reduces environmental pollution, environmental conflicts, organisational risks, and production costs as well as improvements in product quality and production efficiency, which will improve the organizational image and financial performance. Environmentally responsible behaviour can encourage innovation that helps improve business efficiency and commercial competitiveness [30]. There are various findings in the literature considering the nexus.

Research from [22] proved that companies that are actively involved in initiatives to improve environmental performance show positive economic benefits. In general, employees, customers, and government, which are the main stakeholders, can react positively to the green image created by the company and therefore develop a positive attitude. Research from [31] analysed the effect of disclosure of greenhouse gas emissions on Tobin's Q and found a negative effect. It indicates that stakeholders respond negatively to activities that damage the environment such as greenhouse gas emissions. Companies involved in environmental business operations can create affirmative stakeholder perceptions that resulted in increased financial performance. Research by [11] found that firms with a high environmental performance report more information. It most likely emerged due to the economic benefits derived from announcing positive news.

H3: Environmental performance has a positive effect on financial performance.

## Research Framework

### Hypotheses:

H1: Environmental performance has a positive effect on environmental disclosure (Fig. 1).

### Research Framework

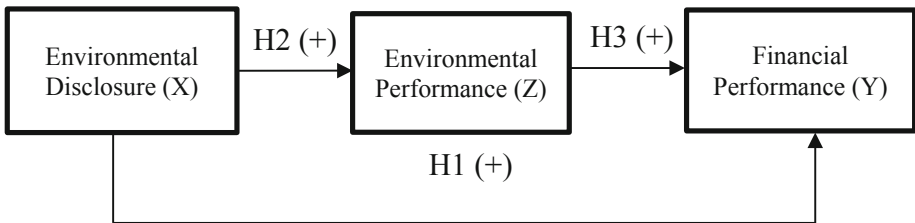


Fig. 1. Empirical research model

H2: Environmental performance has a positive effect on financial performance

H3: Environmental disclosure has a positive effect on financial performance.

## 4 Research Methods

The population in this research were large companies listed on the Indonesia Stock Exchange (IDX) from 2006–2020. The sampling technique was done by purposive sampling, and the data type was secondary. The selected companies were 1.) Companies that have completed information for research, such as Return on Assets, Return on Equity environmental disclosure (EDS), and environmental performance (EP) for the period 2006–2020, 2.) Companies that participated in the PROPER program 2006–2020, 3.) Companies listed on the Indonesia Stock Exchange (IDX) in 2006–2020.

### Variable Description and Empirical Model

This research consisted of three variables: environmental disclosure as the dependent variable, financial performance as the independent variable, and environmental performance as the intervening variable.

#### Financial Performance

Financial performance is a measurement that can be used to describe a company's performance in the financial sector [13]. The financial performance of a company is required as a tool to measure a company's financial health [5]. Research from [32] found that financial performance is from all activities in utilizing the financial resources owned. In other words, the company's financial performance is the impact of activities carried out by management on an ongoing basis or management as a whole. In the era of a market economy, it is necessary to realize superior and efficient financial performance. Furthermore, it needs to be accompanied by ethical financial performance behaviour, namely realising good corporate social responsibility. The financial performance of the company was measured by the profitability of the company which is recognized through ROA and ROE [33].

Return on Equity (ROE) measures the company's net profit divided by the average. It is the company's efficiency measurement in generating profits from each unit of the shareholder equity [10]. Return On Assets (ROA) analyses how successfully the company can utilize its assets to generate revenue and shows the position or level of competitiveness of the company against competitors [27].

#### Environmental Performance

Environmental performance is a measurement of the assessment carried out on the results of environmental conservation activities as a form of concern for the company as a user of existing environmental resources [16]. According to [3], the author defined environmental performance as "the measurable results of an organization's management of its environmental aspects." According to [27], minimizing the environmental impact of economic activities measure the environmental performance of a company. The environmental performance of companies from environmentally sensitive industries can attract the attention of non-financial stakeholders, including community members concerned

with the company's environmental performance, such as neighbouring communities, environmentalists, or regulatory bodies [34]. The researchers collected GHG emissions data from the Bloomberg database to measure the company's environmental performance, referring to research by [35]. In particular, the main measure for emissions and Bloomberg Total GHG Emissions show how far companies have applied their performance to reduce greenhouse gas emissions from their activities. The value of "Total GHG Emissions" is collected by Bloomberg directly from company filings, reports, and other publicly obtained information. Bloomberg has documentation related to published company reports where data is taken to ensure the validity and traceability of all such GHG emission data.

### **Environmental Disclosure**

Environmental disclosure is an activity carried out by the company voluntarily or as a fulfilment of regulatory requirements to provide information about the company's environmental practices and activities. Research by [5], explained that the limitations of the environmental disclosure definition focus on disclosing future environmental costs and cost drivers which are disclosed in the annual report. Environmental disclosure in this research used the Bloomberg score, which has been used in several related academic studies recently [21]. The Bloomberg environmental disclosure score provides environmental information covering 60 different environmental data points, such as energy consumption and emissions, waste data, environmental initiatives, and environmental policies [21]. This data helps objective assessment in measuring environmental disclosure. The data sources include the company's annual report, press release sustainability report, and third-party research. Three factors measure the sustainability and impact of a company's investments on society, including environmental, social, and governance measures. This variable is an indicator of environmental transparency. Bloomberg summarizes these environmental disclosure scores, with higher scores indicating more clarity on environmental issues.

### **Analysis Techniques**

This research used panel data by combining cross-sectional time series observations. The output of this regression was the coefficient of determination, F-test, and T-test. The panel data format will provide valuable results with less collinearity between many variables. The regression method on panel data has fixed effect models. Fixed effects are a way of considering the individuality of each firm or each cross-sectional unit for intercepting various but still estimating the slope coefficient is constant across firms.

## **5 Limitations and Future Research**

This study has several limitations that create opportunities for future research. The limitation of this study is that many companies listed on the Indonesia Stock Exchange do not publish complete financial report data. Furthermore, there are still many shortcomings of researchers in conducting research and data collection which is still limited. Future research should be able to add measurement tools that are proxied by dependent variables other than those used in this study. It is better to understand which financial

performance ratios can be affected by environmental performance and environmental disclosures, such as liquidity ratios and different profitability ratios. Additional research may extend the observation period or increase the number of companies observed to improve data distribution.

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