Does Environmental Risk Affect the Firms’ Financial Performance?

Nila Firdausi Nuzula*
Department of Business Administration, Universitas Brawijaya

*Corresponding author: nilafia@ub.ac.id

Abstract. Companies in South East Asia Countries have significant contributions to improve the countries' economic developments. However, the companies are facing current challenges in which environmental preservation issues receive such lack of attention, and therefore the score of environmental risk tends to increase. The study assumes that the level of environmental risk is affecting the companies' profitability. Using panel data from 1085 companies from Indonesia, Thailand, Singapore, Malaysia, Philippines, and Vietnam for the 2013-2015 period, the study applies Ordinary Least Square (OLS) to examine whether the environmental risk is affecting profitability, proxied by return on assets (ROA). It is interesting, however, that the independent variable does not change ROA. The influence is then becoming significant when the study applies variable controls such as industry, country, year, and total assets. Although, among those controlling variables, total assets and total current liabilities that are not affecting ROA.

1. Introduction
In the last decades, environmental risk management has received greater attention among scholars, corporations and government bodies. For scholars, it is interesting to examine what are the factors that increase environmental risk in corporate level, or to what extent ecological risk awareness is influencing the business performances (for example Sharfman & Fernando, 2008). It is because the environmental strategy on the firm level may lead to less pollution and waste from the effective use of resources. Meanwhile, corporations usually focus on how to deal with environmental issues without deteriorating the expectations of financial stakeholders (Coulson & Dixon, 1995). The company needs to integrate environmental considerations within their corporate strategy in such level in which it does not affect the firms' ability to raise capitals from external sources such as banks and insurances companies that are currently more alert into ethical funds. For the government bodies, they concern how to enhance corporate managers to manage their business impact on the environment (Coulson & Dixon, 1995). The government aims to control the environmental-related externalities effectively due to the rise of current business activities. Under legitimacy theory, the government has an authority to set off the corporations if they do not comply with environmental requirements.

Plenty previous studies have examined the relationship between corporate environmental awareness and acts toward the firms’ financial performance using different perspectives and measurements. Scholars examined whether the environmental performance affects firm risks (for examples: Muhammad et al., 2015 and Cai et al., 2016), some other studied the relationship between environmental
and financial performance (Montabon et al., 2007; Hatakeda et al., 2012; Nuzula, 2018). Also, the measurements applied to quantify environmental performances are varied, from indexes developed by the third parties to quantitative and qualitative data gathered from the firms’ annual social and environmental reports. In the first category, scholars may apply various data such as index from KLD (Cai et al., 2016), or Toxicity Risk Score (TRS) (Muhammad et al., 2015), or Greenhouse Gas Emissions Database from the Japan’s Ministry of the Environment (Hatakeda et al., 2012). For the second category, scholars gathered quantitative data from the firms’ environmental and social responsibility reports by applying content analysis (for example Montabon et al., 2007) or the number of environmental costs allocated for measuring environmental performances of Japanese companies (Nuzula, 2018). The different proxies and measurement methods lead to inconclusive results of relations about environments and the firm’s financial performances.

This study examines the impact of environmental risks stated by the third party on the financial performances of firms operated in Singapore, Malaysia, Indonesia, the Philippines, Thailand, and Vietnam. According to the Stockholm Environment Institute (www.sei.org), Southeast Asia is one of the most at environmental-related risk regions. These countries face the growing environmental challenges for several reasons such as 1) air and water pollution due to the more concentrated population in urban areas; 2) trans-boundary haze due to the rapid expansion of pulpwood and oil palm plantations; 3) climate change impacts such as irregular precipitation and increasing sea-level. Tay et al., (2017) state that the ASEAN Community currently is dealing with environmentally related social concern and supports global cooperation as an element under the socio-cultural pillar in the integration framework.

2. Literature Review

According to Matten (1996), the risk is present if there is a possibility of a negative deviation between the attained goal and the originally intended goal. In environmental management, the targeted objective is the standard level of pollution or the manageable level of contamination. In this level, the managers have devoted their resources to cope with the environmental damage that may occur along with the business operations. Matten (1996) explained that environmental risk comprises the likelihood that the occurrence of externalities is harmful subsequently for the ecological environment and economic aspect of the business. When the company is not able to manage the environmental externalities of their business operations, there will arise an opportunity for ecological damage. It is a so-called ecological risk. However, when the damage remains and disturbs economic factors of business activities, then economic risk rises. Both ecological and economic risks are within the range of environmental hazards.

For business terms, activities to manage environmental risks are under the environmental management framework. They cover various acts to control loss, including loss avoidance, prevention, and reduction (Anderson, 2002). In the context, there are other concepts besides loss control, e.g., risk assessment, crisis and claims management, product design or assessment and risk financing. Among the ideas, however, loss control is essential and cost-effective because it avoids higher costs when a dangerous material gets into air, waterways and other resources. Comparing to recycling and doing such treatment, source reduction or removal from business process and products in many countries is more useful since it could lessen environmental risk (Anderson, 2002).

Anderson (2002) categorized environmental risk management into two levels. The first or lowest level covers the firms' efforts to comply with various regulations. In this level, the company assigns one department, for example, engineering division, to manage the daily operational practices of the company in such way as required by related regulations. The involvement of risk management is small. Since a small part of the organization only holds the firm's engagement into environmental risk management; therefore managers usually put regulations as a burden that adds costs and provides no benefits to the company.

In the second level, environmental risk management is becoming an integral part of business strategy. The companies proactively involve sustainable and environmentally friendly systems in their daily
operations. Implementing the systems may increase value-added to products and services and the level of competitive advantage, improve the firms' image and even attain cost efficiencies. The companies' acts in environmental programs are commonly voluntary. The managers hold pressures from external driven such as government regulations as an encouraging opportunity for improving their strategies.

Current financial accounting and reporting include environmental issues and treat them as substantial to provide information on how the managers deal with potential loss due to the lack of environmental-related actions. Schaltegger & Burritt (2000) state that environmental risk is one crucial information that provides an essential signal of the environmentally-induced financial impact on the firms, such as ecological charges, fees, site abandonment costs, value reduction on production devices, and environmental liabilities.

Managing environmental risk is a strategic business policy that could lead to the improvement of the firm's long-term competitive advantage. When a company can uphold its environmental performance positively, it provides an opportunity to improve competitiveness and create superior financial performance (Yajing, Xu, & Caiping, 2011). The company may formulate long-term environmental policies and goals through the activities that reduce the impact of the firm's product and process on the environment. The company could put the strategies into a specific statement and communicate it to employees and external stakeholders. Next, the company implements the environmental systems and reports the achievements to their interested parties.

3. Hypothesis Development

The fundamental question of the firms' adoptions of environmental issues in internal companies' policies and the firms' performances is on whether the implementation can create an effect on the firms' financial performances. Schaltegger & Burritt (2000) state that it becomes a clear part of the firm's risk structure, therefore managers should inform the risk and the firm's strategies to deal with it through their annual disclosures. Under signaling theory, this current article assumes the investors and other stakeholders use information on environmental risk to develop a fuller picture of the firm's economic performances and the future opportunities and problems as well. The environmental risk could affect the financial performances because the presence of the risk could lead the company to spend ecological expenditures. Therefore, the study hypothesizes as stated below.

\[ H_1 \] Environmental risk influences the firms' Return on Assets
\[ H_2 \] Environmental risk influences the firms' Tobin's Q.

Environmental risk has an association with the firm's financial performance, both accounting- and market-based performance measurements. The author uses two dependent variables since both variables reflect different interest and behavior of stakeholders. Since the first demonstrates the accounting performance of the firm, the managers put more attention on the usefulness of assets creating earnings. Meanwhile, the second measure reveals the interests of shareholders and investors toward the firm's ability to achieve fundamental performance.

4. Research Methods

Grounded in the conclusions of previous studies, the main issue of this study is whether the environmental risk is affecting the firms' financial performance. This study employs data from Osiris database as environmental risk measurement. Using it provides advantages for comparing the environmental impacts of firms with different economic activities. According to the Measuring the Environmental Performance of Industry (MEPI) project (http://www.sustainability-reports.com/), it is one of several challenging factors to quantify environmental performance. Others are no universally accepted approach to weighing different environmental impacts against each other, and no standard approach to environmental reporting and measurements, although academicians have developed a range
of guidelines. They cause the availability and quality of the data are often inadequate. Therefore, the use of data from a research institution would be beneficial to answer the unavailability of proper measurement of environmental risk.

This study develops two regression models. Model 1 uses Return on Assets as the dependent variable, assuming that the number of assets is relevant to create profitability in the company level. ROA is the ratio of earnings after tax to total assets that measures the usefulness of assets. In Model 2, the study applies Tobin’s Q as the dependent variable. Next, assuming that along with environmental risk, there are some other determinants in a country level that may enforce the achievement of profitability, this study includes them in the estimation equation as explanatory variables. Below is the basic specification of estimation.

\[ \text{Financial performance}_{it} = \beta_0 + \beta_1 \text{EnvSc}_{it} + \beta_2 \text{Industry}_{it} + \beta_3 \mu_{it} + \beta_4 \text{Year}_{it} + \beta_5 \text{Size}_{it} + \epsilon_{it} \]

Where \( i \) denotes the firm; \( t \) indicates the period, and \( j \) shows the industry-specific fixed effects and \( \epsilon \) is the standard error term. Financial performance is ROA and Tobin’s Q. EnvSc stands for the environmental score, indicates the level of ecological risk as measured by Osiris Financial Database (www.osiris.bvdinfo.com). The higher the number of environmental scores, the higher the possibility that the earnings would be less due to incurring costs of environmental damages and pollutions impacted by the business operations. Industry denotes for types of industries. This study involves 101 types of industries categorized by Osiris. The year is for the year during the 2013-2015 period. Size reflects the capability of the firm to create financial performance, measured by the number of total assets.

This study develops panel data gathered from 1085 companies from six Southeast Asia countries: Indonesia (135 companies), Thailand (213 companies), Singapore (189 companies), Malaysia (227 companies), Philippines (41 companies), and Vietnam (230 companies) for the 2013-2015 period. The author then applies Ordinary Least Square (OLS) to test the hypothesis.

5. Results and Findings

The descriptive statistic shows that among six countries during 2013-2015, Malaysian companies have the highest number of ROA. It is interesting that the company has the lowest ROA is the one located in Singapore, creating the highest amount of standard deviation among Singaporean companies. Related to companies’ size, measured by total assets in the year, the Singaporean company has the highest number of total size, meaning that the company was the largest company among listed companies in ASEAN countries during 2013-2015. However, a Philippines company has the greatest mean of total assets. When if the author combines it with the fact that the Philippines also the lowest amount of total assets, then it causes the Philippines also has the greatest number of standard deviation among other countries. Contrarily, Vietnamese has the lowest mean of total assets causing companies. Table 1 below shows the summary of statistics for ROA, Size, Environmental Risk, and Tobin’s q of companies in six countries in the Southeast Asian Region.

Table 1 shows data for the environmental score that companies in Malaysia and Vietnam have the highest maximum amount of environmental score. It means they are environmentally riskier than others. A company in Singapore holds the lowest mean of the environmental score, saying that companies in the country commonly have been able to handle the ecological risk since the more significant the score, the higher the environmental risk. Next, related to Tobin’s q as the indicator of market-based performance, a company in Indonesia has the maximum number of Tobin’s q, as well as the highest mean and standard deviation. It implies that companies in the country are having such dispersed attainment of Tobin’s q.

The null hypothesis states that there is no environmental risk effect on firm financial performance. The study then applies two general models for the hypothesis testing. Model 1 is using ROA as the
dependent variable, representing accounting-based financial performance, while Model 2 is asking Tobin's q as the dependent variable, on behalf of market-based financial performance. Tables below serve the results of OLS with ROA as the dependent variable (Table 2) and Tobin's q as the dependent variable (Table 3).

Table 1. Summary of Statistics

| Countries | Return on Asset (USD 000) | Mean | Minimum | Standard Dev. |
|-----------|---------------------------|------|---------|---------------|
| Indonesia | 52.5700                   | 4.3014 | -34.6000 | 9.9714        |
| Malaysia  | 75.4000                   | 3.4933 | -84.6000 | 10.0349       |
| Philippines | 31.0400               | 2.9527 | -34.7900 | 9.0677        |
| Singapore | 74.5600                   | 0.5011 | -94.1000 | 15.0948       |
| Thailand  | 30.2100                   | 4.8540 | -37.8300 | 7.7853        |
| Vietnam   | 28.7500                   | 3.9807 | -70.5200 | 8.7312        |

| Countries | Size (Total Assets) ($) | Mean | Minimum | Standard Dev. |
|-----------|-------------------------|------|---------|---------------|
| Indonesia | 18,999,047.36           | 601,841.47 | 554.42  | 1,834,023.72  |
| Malaysia  | 12,485,627.01           | 327,932.87 | 1,498.98 | 1,197,264.28  |
| Philippines | 27,287,558.84       | 1,778,046.26 | 398.39  | 5,093,018.91  |
| Singapore | 46,631,795.00           | 727,759.42 | 2,907.82 | 3,699,765.14  |
| Thailand  | 14,131,682.01           | 478,385.44 | 5,552.01 | 1,668,052.96  |
| Vietnam   | 1,165,224.68            | 56,498.31  | 552.67  | 123,903.78    |

| Countries | Environmental Risk (score) | Mean | Minimum | Standard Dev. |
|-----------|----------------------------|------|---------|---------------|
| Indonesia | 54.6000                    | 8.5975 | 0.9600  | 8.5804        |
| Malaysia  | 142.9400                   | 7.5232 | 0.8800  | 11.6091       |
| Philippines | 100.7800                   | 14.3614 | 1.1800  | 19.2153       |
| Singapore | 102.0300                   | 7.4609 | 0.9000  | 11.2914       |
| Thailand  | 100.7800                   | 7.7610 | 1.1600  | 11.3726       |
| Vietnam   | 142.9400                   | 8.0745 | 1.1600  | 10.4007       |

| Countries | Tobin’s q (score) | Mean | Minimum | Standard Dev. |
|-----------|-------------------|------|---------|---------------|
| Indonesia | 37.1920           | 1.4782 | 0.0140  | 3.4095        |
| Malaysia  | 14.4760           | 0.8991 | 0.0000  | 1.2355        |
| Philippines | 18.4920          | 1.1346 | 0.0650  | 1.9044        |
| Singapore | 4.6130            | 0.6413 | 0.0220  | 0.6550        |
| Thailand  | 11.5550           | 1.0947 | 0.0000  | 1.1026        |
| Vietnam   | 2.6320            | 0.5368 | 0.0000  | 0.4583        |
Table 2. Results of Ordinary Least Square (OLS) with ROA as the Dependent Variable (Model 1)

| Model 1a | Model 1b | Model 1c | Model 1d | Model 1e |
|----------|----------|----------|----------|----------|
| Coefficient | Coefficient | Coefficient | Coefficient | Coefficient |
| const | 3.18214*** | 1.97233*** | 1.6437*** | 1830.76*** | 1830.44*** |
| EnvSc | 0.0294633 | 0.0381389** | 0.0373995** | 0.0376464** | 0.036223** |
| Industry | 0.0396632*** | 0.0373995*** | 0.0385327*** | 0.038517*** |
| Country | 0.116562 | 0.116489 | 0.118555 |
| Year | −0.908204*** | −0.908057*** |
| Size | 6.11E-08 |
| F | 3.29872 | 12.77007 | 8.859413 | 10.41792 | 8.435363 |
| P-value (F) | 0.069426 | 3.00E-06 | 7.61E-06 | 2.22E-08 | 6.15E-08 |
| Adj R² | 24565.26 | 0.007644 | 0.007656 | 0.012177 | 0.012019 |

For Model 1, the author runs several subsequent models to examine the ability of EnvSc to affect the firm's accounting-based financial performance as the individual factors, and as simultaneous factors with controlling variables, e.g., Industry, Country, Year, and Size. It is interesting that as a standalone independent variable, the EnvSc is not significant to determine the financial performance (Model 1a). However, when the author employs Industry to control the regression, EnvSc then significantly affect ROA (Model 1b). It implies that EnvSc is significant to create ROA in specific industries. Model 1b has the highest F-number, although the adjusted R-squared is the lowest one. Next, in model 1c, the author adds Country as a controlling variable. However, the p-value of simultaneous regression shows no increase, and the Country does not affect ROA significantly. Table 2 also indicates that Country also does not create firms performance in the next models. Model 1d and Model 1e show that as one controlling variable, Year has a significant effect on ROA, implying that the Year when the company operated is affecting the ROA.

Table 3. Results of Ordinary Least Square (OLS) with Tobin’s Q as the Dependent Variable (Model 2)

| Model 2a | Model 2b | Model 2c | Model 2d | Model 2e |
|----------|----------|----------|----------|----------|
| Coefficient | Coefficient | Coefficient | Coefficient | Coefficient |
| const | 0.907993*** | 0.737327*** | 0.664371*** | −22.3204*** | −21.9941 |
| EnvSc | 0.00210853 | 0.00285313 | 0.00270303 | 0.00270034 | 0.003001 |
| Industry | 0.00577103*** | 0.00552338*** | 0.00552124*** | 0.005528*** |
| Country | 0.0258099 | 0.0258433 | 0.025415 |
| Year | 0.114124 | 0.011253 |
| Size | −1.27542E-08 |
| F | 0.67464 | 9.484836 | 7.020011 | 5.287293 | 4.422433 |
| P-value (F) | 0.411507 | 0.000078 | 0.000106 | 0.000305 | 0.0000515 |
| Adj R² | −0.000113 | 0.005886 | 0.006262 | 0.005948 | 0.005935 |

Table 3 above shows the results of OLS for Tobin’s q as the dependent variable. Model 2a shows that environmental risk does not affect Tobin’s q significantly, even when the author applies Industry as the controlling variable (Model 2b), Country (Model 2c), Year (Model 2d), and Size (Model 2e).
Independent variable that affects Tobin’s q from the beginning is Industry, implying that the presence of Tobin’s q is dependent upon what industry the companies are connected. Seemingly, one sector can gain higher market-based performance than another does.

The models show that environmental risk alone does not affect ROA and Tobin’s Q significantly. The author interprets that information about environmental risk may not awake the top management, as it has indicated by Schaltegger & Burritt (2000). According to them, the presence of ecological risk data could represent how well the companies to comprehend the concept of responsible behavior and therefore, to apply strategies for protecting the firm from environmental risk. However, the findings indicate that the presence of ecological risk does not influence the realization of the firm's financial performance.

Further, it is fruitful to comprehend how is the firms' reactions when environmental risk being there. Do they set specific policies to cope with environmental challenges? Sharfman & Fernando (2008) noted that if a firm arranges a greener policy of their business operations, they will use their resources more economically effective. Undertaking environmental risk management activities leads to the improvement of environmental performances since it can reduce the likelihood that firms will encounter extreme environmental events. It also creates greater opportunity for the firms to avoid the decrease of profitability, firms' reputation, or firms' value of its asset base. According to Anderson (2002), the environmental risk could become a negative externality. It encourages the firms to litigate the risk since the managers are more aware that the risk may affect other areas of risk, such as the company's reputation, business operation, and ethical risk. Matten (1996) stated environmental risk might create costs consequences due to the rise of both problems and opportunities for the internal company. If the constraints are going up, the costs to overcome the issues may lessen the earnings after taxes.

Similarly, if the company perceives the environmental risks as the opportunities for improving competitive advantages, it possibly will lead to spending that in short-term may reduce the firm's targeted financial performance. Following this, it is reasonable to assume that the rise of environmental risk does encourage the firm to establish environmental-related policies and, on another side, to rearrange the consumption of their resources more efficiently. However, the activities are not significant to create higher financial performances of the firm.

It is interesting that environmental risk does influence accounting-returns from assets invested in the companies along with consideration in which industry the company belongs to and in what year the companies operate. Since this study does not stick on types of industry in the panel data, the result suggests further studies to examine which industry that lead the companies more aware to environmental risk then it leads to improving their financial performances. Findings on Model 2 also portray that market shares give more attention to which industry that creates shareholders value than other factors, even the environmental risk. However, following the results, to deduce that shareholders seem do not offer sufficient thoughtfulness to environmental risk informed by the third party may be misleading. The author expects further study may confirm this fascinating issue.

6. Concluding Remarks

The study examines the presence of environmental risk and its impact on accounting-based and market-based financial performance. Using return on asset (ROA) as the proxy for accounting-based performance (Model 1), the author finds that environmental risk merely does not lead the company to perform. However, when the regressions include Industry, Country, Year, and Size as the controlling variables, then the environmental risk is significant to influence the ROA. In Model 2, the author applies Tobin’s q as the dependent variable. The findings show that environmental risk does not affect the market-based financial performance, even when the controlling variables are in the regression models. Industry shows up as the only variable that influences Tobin’s q, implying that markets denote the presence of environmental risk referring to the industry to where the company is belonging.
References

[1] Anderson, D. R. (2002). Environmental risk management: A critical part of corporate strategy. The Geneva Papers on Risk and Insurance, 27(2), 152-180.

[2] Cai, L., Cui, J., & Jo, H. (2016). Corporate environmental responsibility and firm risk. Journal of Business Ethics, 139, 563-594.

[3] Coulson, A. B., & Dixon, R. (1995). Environmental risk and management strategy: the implications for financial institutions. International Journal of Bank Marketing, 13(2), 22-29.

[4] Hatakeda, T., Kokubu, K., Kajiwara, T., & Nishitani, K. (2012). Factors influencing corporate environmental protection activities for Greenhouse Gas Emission Reductions: the relationship between environmental and financial performance. Environmental Resource Economy, 53, 455-481.

[5] Iwata, H., & Okada, K. (2011). How does environmental performance affect financial performance? Evidence from Japanese manufacturing firms. Ecological Economics, 70, 1691-1700.

[6] Matten, D. (1996, July). Environmental risk management in commercial enterprises. The Geneva Papers on Risk and Insurance, 21(80), 360-382.

[7] Montabon, F., Sroufe, R., & Narasimhan, R. (2007). An examination of corporate reporting, environmental management practices and firm performance. Journal of Operations Management, 25, 998-1014.

[8] Muhammad, N., Scrimgeour, F., Reddy, K., & Abidin, S. (2015). The impact of corporate environmental performance on market risk: the Australian Industry case. Journal of Business Ethics, 132, 347-362.

[9] Nuzula, N. F. (2018). Does environmental cost affect Japanese firms' performance? Innovation Management, Entrepreneurship and Sustainability 2018, Proceedings of the 6th International Conference (pp. 821-830). Prague: Vysoka skola ekonomicka v Praze, Nakladatelstvi Oeconomica, Praha. doi:10.18267/pr.2018.dvo.2274.0

[10] Schaltegger, S., & Burritt, R. (2000). Contemporary Environmental Accounting: Issues, Concepts, and Practice. Sheffield, United Kingdom: Greenleaf Publishing Limited.

[11] Sharfman, M. P., & Fernando, C. S. (2008). Environmental risk management and the cost of capital. Strategic Management Journal, 29, 569-592.

[12] Tay, S. S., Lee, C. C., & Yi, L. X. (2017, September 7). https://asean.org/global-megatrends/. Retrieved November 14, 2018, from www.asean.org: https://asean.org/storage/2017/09/Ch.4_ASEAN-Approaches-to-Environmental-Protection-and-Sustainable-Dev.pdf

[13] Watson, K., Klingenberg, B., Polito, T., & Geurts, T. G. (2004). Impact of environmental management system implementation on financial performance. Management of Environmental Quality: An International Journal, 15(6), 622-628.

[14] Yajing, Z., Xu, X., & Caiping, Z. (2011). Research on environmental financial risk management and construction of environmental management system. In Y. Zhou, & D. D. Wu, Modeling Risk Management for Resources and Environment in China: Computational Risk Management (pp. 333-340). Heidelberg: Springer-Verlag.