Environmental Quality in Indonesia: Disruption by Economic Agents

by Sukanto Sukanto

Environmental Quality in Indonesia: Disruption by Economic Agents

Azwardi AZWARDI [1], **Sukanto SUKANTO** [2], **Nazeli ADNAN** [3], **Arika KURNIAWAN** [4]

Abstract

Purpose: This study aims to determine the effect of economic agents, such as the amount of government expenditure on the environment, households, manufacturing industry, and shipping activities; on environmental degradation in Indonesia. **Research design, data, and methodology:** This study is conducted with 264 observations from panel data of 33 provinces during 2010-2017. Environmental degradation is measured by using the environmental quality index collected from Indonesian Ministry of Forestry and Indonesian Central Bureau of Statistics. Three testing models are used to test the panel data, namely Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). **Results:** The research findings show that the amount of government expenditure on the environment, households, and shipping activities have a negative and significant effects on environmental degradation, while the number of manufacturing industry has positive and significant effect on environmental degradation. Unlike the previous studies, the result also shows that government expenditure on environmental has a positive and significant effect on environmental quality index. **Conclusion:** It can be concluded that even though Indonesian government spent a low budget on environment, their environmental regulation has succeeded both in reducing environmental degradation and increasing the environmental quality as indicated by Indonesian environmental quality index.

Keywords : Environmental Quality in Indonesia, Government Expenditure, Industry Shipping Activities

JEL Classification Code: Q50, Q53, Q56, Q57, Q58

1. Introduction

With a gross domestic product of 56 million rupiahs, Indonesia became one of the countries with highest economic growth in Southeast Asia in the first quarter of 2019. The economic growth projected by the increase in economic activity, such as production, consumption and distribution, leads to wellness of human-beings, giving positive impact to economic growth in Indonesia (World Bank, 2020). Economic growth also brings negative impacts along with those positive impacts. One of those negative impacts is the environmental degradation which in turn raises issues of sustainability (Wang & Chuang, 2011; He & Wang, 2012).

The global increase of good and services demand, which in turn leads to the increase of economic activities and production, causes environmental degradation (Rahman, 2020; Shahbaz, Khan, & Ali, 2017). The aspect of environmental degradation can be seen through the degradation and depletion in air, water, soil, and land quality

1 First Author and Corresponding Author, Lecturer at the Department of Economy, Faculty of Economy, Sriwijaya University, Indonesia. Email: azwardi@fe.unsri.ac.id
2 Lecturer at the Department of Economy, Faculty of Economy, Sriwijaya University, Indonesia. Email: soekanto0813@fe.unsri.ac.id
3 Lecturer at the Department of Economy, Faculty of Economy, Sriwijaya University, Indonesia. Email: nazeli.adnan@yahoo.co.id
4 Postgraduate student at the Department of Economy, Faculty of Economy, Sriwijaya University, Palembang, Indonesia. Email: arikakurniawan0@gmail.com

(Tietenberg & Lewis, 2012). The rapid growth of population, economic, and the use of high technology combined with the depletion of natural resources result in high rate of pollution (Perman, Ma, & McGilvary, 2003). Human activities in economic, agriculture, industry and transportation have a significant impact on air and water pollution. The air and water pollution bring another important issues in sustainable economic development, increasing public anxiety about global warming. Output production activity and economic growth caused the increasing of environmental degradation (Chaudhry, Tanveer, & Naz, 2017). Jakarta, the capital city of Indonesia as well as the center of economic activity, is listed as one of the most polluted cities.

Not only causing the the air and water pollution, the human activities along with oher industrial and governmental activities, such as house building and infrastructure constructing, change the land use. The economic growth in line with the deforestation (Damania, Russ, & Wheler, 2018), causing the clearing of lots of forest and land to support the economic growth, which in turn threatening the amount of land that provide clear air. Indonesia suffered land loss 328.724 acres in 2019 as the result of the forest, resulting in 3 million people affected by air pollution. Environmental quality in Indonesia can be measured by the value of environmental quality index (Indonesia Ministry of Forestry). The index measures the quality of air, water and land cover, which means the lower environmental index presented the higher environmental degradation and the lower quality of environment. Indonesia's environmental quality index in 2017 present the improvement but the value 66,46 still indicated the low environmental quality.

Table 1: Environmental Quality Index (Aggregate and Disaggregate) in Indonesia 2016-2017

Year	Air Quality Index	Water Quality Index	Land Cover Quality Index	Environmental Quality Index
2016	81,61	60,38	57,83	65,73
2017	87,03	58,68	56,88	66,46
Shift	5,42	-1,70	-0,95	0,73

Source: Forestry Ministry of Indonesia, 2017

The environmental degradation not only caused by the household, industry and government activities but also the policy regarding the environment. The government expenditure to help improving environmental quality also plays an important roles. Environmental degradation such as destruction of forests and soil and extinction of flora and fauna is a problem that must be taken into account by academics, economists and policy makers (Azam, Gigot, & Witte, 2016). Environmental degradation plays a significant role that affected the sustainable growth and development.

Some studies namely He and Wang (2012); Suparmoko (2000); and Chen, Huang, and Lin (2019) have empirically explored the linkage of economic growth and air pollutant (emissions) using Kuznet curve hypothesis. In short, previous studies limited the linkage between emissions and economic growth, focusing on confirmed the validity of environmental Kuznet curve (EKC). The quantitative study about the economic activities (production, consumption and distribution) in Indonesia still has limited explanatory variables. This study focusing on how the economic activities variable linkage to the environmental degradation, using government expenditure on environment, number of household, number of manufacture industry, and shipping activities.

2. Literature Review

Most of the previous empirical studies explain the environmental degradation projected to the carbon emissions associated with the economic growth. The most popular study which prove the Environmetal Kuznet Curve, first proposed by Grossman and Krueger (1991), and Stern (2004). This study explains that economic growth causes the environmental degradation in early stages, and slowly decreased as economic growth increases. The other previous studies use the air pollutant (carbon emissions). He and Wang (2012), for example, develop the study using panel data to analyze the important factors that caused the U-turn in Environmental Kuznet Curve (EKC) for developing country. They analyze the important role of economic structure, development strategy and environmental regulation and their effects to the environmental quality and economic growth with the different variation in each stages of economic growth. The environmental degradation and economic growth are both studied in different approach.

Mohammed, Guo, and Haq (2019) finds that the coefficient of government expenditure has a significant positive effect on increased pollution. This finding is consistent with Bernauer and Koubi (2006); Lopez and Palacios (2010) which states that government expenditure reduces environmental quality. Lopez, Galinato, and Islam (2011) argued that government expenditure causes environmental degradation, unless it is shifted towards social and public goods that produce lower pollution. On the other hand, Halkos and Paizanos (2013) stated that government expenditure has no significant effect on carbon emissions. Halkos (2012) found direct effects of negative government expenditure on both SO_2 emissions and CO_2 per capita.

Ivanova, Stadler, and Steen-Oslen (2015) stated that household expenditure has a positive and very significant relationship to environmental impacts. The results of

elasticity show that the strong and significant relationship between household expenditure and its impact on the environment is driven by an increasing demand for non-primary consumer goods. Castellani, Beylot, and Sala (2019) through a process-based LCA approach and input-output tables identified food consumption as the main driver of direct emission impacts. Shivashankara and Siddegowda (2011) concluded that the main threat to household environmental conditions is population density, where household environmental problems are most severe in low-income households.

Singh, Kumari, and Nandan (2016) states that the production of electronic waste has become a global environmental problem because certain electronic components of the product contain hazardous materials that threaten human health and the environment. Hoque, Mohiuddin, and Su (2018) stated that pollution carried out by industry has a big impact on human health and the natural environment resulting in socio-ecological problems and creating large social costs in developing countries. Harun, Taha, and Salaam (2013) showed that the goods production process has an impact on the environment, depending on the choice of materials and the design of a product, as the manufacture of a product is directly connected to the amount of carbon emitted from the use of electrical energy during the production process. Linder (2017) stated that port has an impact on emissions arising from activities or operations. The invention of the Vessel Speed Reduction (VSR) program resulted in significant emission reductions.

The relationship between economic development and environmental quality was studied by Bashir, Susetyo, and Suhel (2021), who found that a relationship between economic growth and CO₂ emissions reveals in the environmental Kuznets curve in Indonesia. Therefore, policies are needed to be taken in order to limit the impact of urbanization by increasing awareness to maintain environmental quality and greater use of energy. In addition, energy conservation policies are needed in all sectors, especially the electricity, industry, and transportation sectors. Consistent with this, Yessekina and Urpekova (2015) discuss trends in world energy consumption in the transportation sector and emphasize their dependence on fuel. The article also describes the dynamics of energy use and CO₂ emissions from transportation which found that a number of problems in the transport sector hinder the implementation of energy efficiency measures and measures to reduce CO₂ emissions. A broader study related to economic development in terms of tourism and environmental degradation was analyzed by Lee and Syah (2018) who found that there is a long-term balance relationship between tourism revenue, environmental degradation, and economic growth in Indonesia. In that case, when tourism growth in the economy starts to materialize, it

shows that environmental degradation is increasing inversely in the model, which in turn has a negative impact on the environment. In line with this (Islam, Ahmed, & Saifullah Huda, 2017) reveals that carbon emissions have a consistent impact on industrial production over time, whereas industrial production has a high impact on emissions in the short term that fades in the long run which is in line with the environmental hypothesis in Kuznets Curve (EKC). Carbon emissions increase with GDP per capita and at the same time, their low long-term impact on the industry index suggests there may be other sources of pollution as economic income increases. The same result was revealed by Hojjat (2014) which found that there was a potential impact of economic growth and development on environmental quality.

3. Empirical Methodology and Data

This study analyzes the economic condition, economic activity and environmental degradation in Indonesia using panel data of 33 provinces during 2010-2017 with the total 264 observations. Environmental degradation measured by the environmental quality index. The economic agents that affected environmental degradation are measured using the government expenditure for environment, number of household, number of manufacture industry, and shipping activities. To analyze the impact of environmental degradation and other regressors, we use following model:

$$lnIKLH_{it} = \propto + \beta_1 lnPPL_{it} + \beta_2 lnJRT_{it}$$
$$+ \beta_3 lnJI_{it} + \beta_4 lnAP_{it} + e_{it} \ \ .... (1)$$

where: $\propto$ is defined as a constant, while β_1, β_2, β_3, and β_4 are the coefficients, and i and t are the provinces and 2010-2017. IKLH is environmental damage which is proxied by environmental quality index value. PPL is the government spending on the environment, the JRT is the total number of households, JI is proxied by the total number of industrial manufacturing industry, the AP is the total shipping activities, and e$_{is}$ is the error term.

The data used in this study were collected from Indonesian Ministry of Forestry and the Indonesian Central Bureau of Statistics. This research uses natural logarithmic data transformation for each variable used. The panel data are tested using three models, namely the common effect model (CEM), fixed effect model (FEM) and random effect model (REM) including the Chow test, the Hausman test and the Lagrange Multiplier test. Definition and measurement of variables, as well as initial hypotheses which are denoted by a positive or negative sign, can be seen in Table 2 as follows.

Table 2: Operational Definition of Variables, Measurement and Hypotheses

Variables	Description	Expected Sign
Endogenous Variable Environmental Quality Index (IKLH)	Indication of quick conclusion of environmental contion at a certain scope and period (index)	
Exogenous Variables; Government expenditure for Environment (bil. Rp) (PPL)	Government expenditure from regional budget in one period for improving environment condition	+
Total of Household (Thousand) (JRT)	Group of person who inhabit in physical building	-
Total of Manufacturing Industry (Thousand) (JI)	Industry that processed raw material	-
Total of Shipping Activities (unit) (AP)	Total of Shipping Activities	+

Source: Badulescu & Simut, 2019; Ng, Zhang, & Afenyo, 2018; Yang, Lee, & Wang, 2018; Siddegowda, 2011; Barr, 2007.

Referring to previous research and previous theories in particular by Badulescu and Simut (2019), Ng, Zhang and Afenyo (2018), Yang, Lee, and Wang (2018) Siddegowda (2011), and Barr (2007) which empirically measures environmental degradation in terms of economic factors, namely environmental government expenditures, the number of households, the number of manufacturing industries, and shipping activities. Thus, the conceptual framework can be described in Figure 1 as follows:
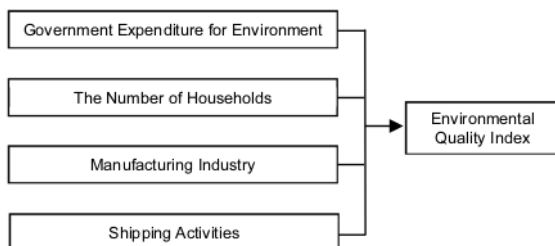
Figure 1: Research Model

The relationship between *exogenous variables and Endogenous Variables produces perspective* a hypothesis to measure environmental degradation from the economic agents. In detail, the hypothesis can be a description of the relationship between these variables. A specific summary of the list of hypotheses that refers to previous research can be explained in Table 3:

Table 3: Research Hypotheses

No	Hypotheses	Refers
H$_1$	Government Expenditure for Environment has a positive and significant effect on environmental quality	Badulescu & Simut (2019)
H$_2$	The number of Households has a negative and significant effect on environmental quality	Shivashankara & Siddegowda (2011); Barr(2007)
H$_3$	Manufacturing Industry has a negative and significant effect on environmental quality	Badulescu & Simut (2019)
H$_4$	Shipping Activities have a positive and significant effect on environmental quality	Bjerkan & Seter (2019); Ng, Zhang, & Afenyo (2018); Yang, Lee, & Wang (2018)

4. Results and Discussion

This study aims to determine the effect of government expenditure in terms of the environment, the number of households, the number of industries and agricultural areas on the environmental quality index of 33 provinces in Indonesia during the 2010-2017 period. The estimation used the fixed effect model, the random effect model, and the method robust least square. Table 4 shows descriptively all the variables, both dependent and independent. Minimum, maximum, mean, and standard deviation values to be analyzed empirically.

Table 4: Descriptive Statistics

Variabel	Minimum	Maximum	Mean	Std. Deviation
IKLH	31.97	98.89	69.08	13.81
PPL	2801.00	2668430000000.00	51005341561.54	241303198512.55
JRT	168.10	12915.30	1960.02	2880.74
JI	896.00	19220.00	4138.68	3333.51
AP	1086.00	229795.00	25034.60	39222.82

Source: Proceed Data, 2020

The results of Chow, Hausman and LM tests show that the best model is the fixed effect model which is shown from the p-value of the Chow test which is smaller than the level of significance and the p-value of the Hausman test which is greater than the level of significance. Meanwhile, based on LM test, it shows p-value <0.05, which indicates that the best model based on LM testing is the random effect model. The conclusion of the results of the three tests is the fixed effect model which is chosen for the interpretation of the results (Table 5).

In estimation, the selected model is the fixed effect model based on the results of the Hausman and F tests. Table 5 shows that all independent variables can explain the variation in the dependent variable by 53.44 percent. Meanwhile, simultaneously it shows a high f-statistical value so it can be said that all variables have a significant effect simultaneously on the environmental quality index variable. All variables except shipping activities (AP) have

a statistically significant effect, as shown in Table 5 as follows.

Using robust least square to estimate the consistency of the model, the results show that government expenditure from the environmental side and the number of households will reduce environmental quality. The estimation results indicate the increasing of these variables will reduce the quality of the environment in Indonesia as measured by the environmental quality index.

In Table 6, it can be seen that our findings on government expenditure on environmental quality contradict previous studies by He and Wang (2012) who found that government expenditure positively affects environmental quality. In fact, government budget that allocated for environmental functions in the 2018 is very small, namely 15.7 trillion rupiahs. Compared to the total central expenditure budget which reached 1,454.5 trillion rupiahs, the environmental function budget allocation is only 1.07 percent (Indonesian Ministry of Finance, 2018).

Table 5: Estimation Result of Fixed Effect Model and Random Effect Model

Dependent variable: *In* IKLH (Environmental Quality Index)					
Variable	Descriptions	Fixed Effect		Random effect	
		Coefficient	t-ratio	Coefficient	t-ratio
C	Constant	4.635	41.006***	4.595	20.019***
In PPL	Government Expenditure for Environment	-0.009	-6.308***	-0.010	-6.883***
In JRT	The Number of Households	-0.125	-7.195***	-0.134	-4.827***
In JI	Manufacturing Industry	0.090	3.615***	0.089	2.454***
In AP	Shipping Activities	-0.007	-0.889	0.003	0.268
Summary:					
R^2		0.5344		0.3006	
Adj. R^2		0.5248		0.2862	
SE. of Regression		0.1754		0.1367	
F-statistics		55.957***		20.955***	
Selected method:					
Chow test		5.122***		-	
Hausman test		-		4.604	
LM test		214.69***		-	

Note: *, ** and *** denote a significance level of 10%, 5% and 1% respectively
Source: Data Processed, 2020

Table 6: Estimation Results of Robust Least Square

Dependent variable: *In* IKLH				
Variable	Descriptions	Coefficient	z-Statistic	Prob.
Constant	Constant	4.707	30.136	0.000***
In PPL	Government Expenditure for Environment	-0.009	-6.210	0.000***
In JRT	The Number of Households	-0.123	-7.229	0.000***
In JI	Manufacturing Industry	0.082	3.326	0.000***
In AP	Shipping Activities	-0.009	-1.006	0.314
Summary:				
R^2		0.3097		
Adj. R^2		0.2955		
Rw^2		0.4468		
Adj. Rw^2		0.4468		

Note: *, ** and *** denote a significance level of 10%, 5% and 1% respectively
Source: Data Processed, 2020

The number of households has a significant and negative effect on environmental quality in Indonesia. The number of households clearly has a very high relationship to environmental quality in an area. Research by Shivashankara and Siddegowda (2011) discussing environmental and household problems in developing countries found that the lack of facilities with poor living conditions causes the quality of the environment to deteriorate. This household behavior is very different in developed countries that concerned about the environment. Barr (2007) found that the United Kingdom has implemented waste recycling and almost all people care about the environment by reducing household waste, both garbage and household production.

According to Indonesian Environmental Statistics (2018) sources of air pollution can come from transportation, industry, burning waste, and household activities. This finding supports previous studies that found economic activities by households, especially household behavior, cause environmental degradation. The increasing number of industries can cause the decrease of environmental quality, but the stringent government regulation for industries, the less environmental damage that can occur. Indonesia has strict regulations that can force companies to pay attention or provide solutions for the environment which are regulated in Presidential Regulation Number 28 in 2008, concerning national industrial policies regarding the provision of facilities to industries that protect the environment.

Shipping activities have an impact on environmental degradation. Environmental degradation caused by these activities is water pollution and air pollution, especially carbon emissions (Lindstad & Eskeland, 2016). However, this result contradicts the study by Ng, Zhang, and Afenyo (2018), and Yang, Lee, and Wang (2018) which proved that port activity is a tool to mitigate environmental degradation, especially climate change and function in the transportation and economic system make it a key factor in sustainable development (Bjerkan & Seter, 2019). However, it contradicts with this study, which empirically proves that shipping activities in Indonesia will reduce the environmental quality index. It proves that Indonesian shipping activities are still categorized as traditional shipping which causes a decrease in environmental quality (Parmawati & Kurnianto, 2019). Environmental degradation caused by shipping can be mitigated if it meets 4 categories, namely (i) port management and planning, (ii) power and fuel, (iii) marine activities, and (iv) land activities (Bjerkan & Seter, 2019; Ng, Zhang, & Afenyo, 2018; Yang, Lee, & Wang, 2018).

5. Conclusion

This study determines the effect of government expenditure on environment, the number of households, the number of industries, and shipping activities on the environmental quality index in Indonesia using panel data regression with Robust Test approach. Empirically, it shows that government expenditure on environment, the number of households, and shipping activities have a negative and significant effect on environmental quality, while the number of industries has a positive and significant effect on environmental quality. The results of this study are generally contradict Badulescu and Simut (2019) who found that regulations related to government budgets will reduce pollution, in terms of improving health. The results of this study are consistent to Badulescu and Simut (2019) who said that government expenditure has a positive impact on environmental degradation or government expenditure reduces environmental quality. Indonesia is still categorized as having low environmental budget-related regulations (Ministry of Finance, 2018). The environmental quality is determined by household behavior, on which Indonesia is categorized as having low concern for the environment from the household side seen from the second-highest level of pollution after China. Indonesian regulations relating to household pollution are contained in the Government of Indonesia's Long-Term National Urban Development Plan 2015-2045, which obliges households to reduce plastic and marine debris by 70 percent by 2025 (World Bank, 2018). The role of port activities in improving the environment has not succeeded yet because it has not fulfilled 4 categories, namely (i) port management and planning, (ii) power and fuel, (iii) marine activities, and (iv) land activities.

References

Aiman Yessekina, and Amina Urpekova. 2015. "Energy Efficiency and CO^2 Emissions of the Transportation System of Kazakhstan: A Case of Almaty." *The Journal of Asian Finance, Economics and Business 2*(3): 41-46. https://doi.org/10.13106/jafeb.2015.vol2.no3.41.

Arellano, M. (2003). *Panel Data Econometrics*. Oxford: Oxford University Press.

Azam, C. S., Gigot, G., Witte, I., & Schatz, B. (2016). National and Subnational Red Lists in European and Mediterranean Countries: Current State and Use for Conservation. *Endangered Species Research, 30*, 255-266. https://doi.org/10.3354/esr00740

Badulescu, D., Simut, R., Badulescu, A., & Badulescu, A. V. (2019). The relative effects of economic growth, environmental pollution and non-communicable diseases on health expenditures in european union countries. *International Journal of Environmental Research and Public Health, 16*(24), 1-19. https://doi.org/10.3390/ijerph16245115

Barr, S. (2007). Factors Influencing Environmental Attitudes and Behaviors A. U.K. Case Study of Household Waste Management. *Environment and Behavior*, *39*(4), 435-473. https://doi.org/10.1177/0013916505283421

Bashir, Abdul, Didik Susetyo, Suhel Suhel, and Azwardi Azwardi. 2021. "Relationships between Urbanization, Economic Growth, Energy Consumption, and CO₂ Emissions: Empirical Evidence from Indonesia." *Journal of Asian Finance, Economics and Business* *8*(3): 79-90. https://doi.org/10.13106/jafeb.2021.vol8.no3.0079

Bernauer, T., & Koubi, V. (2006). States as Providers of Public Goods: How Does Government Size Affect Environmental Quality?. https://doi.org/10.2139/ssrn.900487

Bjerkan, K. Y., & Seter, H. (2019). Reviewing tools and technologies for sustainable ports: Does research enable decision making in ports? *Transportation Research Part D: Transport and Environment*, *72*(May), 243-260. https://doi.org/10.1016/j.trd.2019.05.003

Castellani, V., Beylot, A., & Sala, S. (2019). Environmental Impacts of Household Consumption in Europe: Comparing Process-based LCA and Environmentally Extended Input-Output Analysis. *Journal of Cleaner Production*, *240*. https://doi.org/10.1016/j.jclepro.2019.117966

Chaudhry, A., Tanveer, H., & Naz, R. (2017). Unique and Multiple Equilibria in a Macroeconomic Model With Environmental Quality: An Analysis of Local Stability. *Economic Modelling*, *63*, 206-214. https://doi.org/10.1016/j.econmod.2017.02.009

Chen, X., Huang, B., & Lin, C.-T. (2019). Environmental Awareness and Environmental Kuznets Curve. *Economic Modelling*, *77*, 2-11. https://doi.org/10.1016/j.econmod.2019.02.003

Damania, R., Russ, J., Wheeler, D., & Federico, A. (2018). The Road to Growth : Measuring the Tradeoffs between Economic Growth and Ecological Destruction. *World Development*, 351-376. https://doi.org/10.1016/j.worlddev.2017.06.001

Grossman, G. M., & Krueger, A. B. (1991). *Environmental Impacts of a North American Free Trade Agreement* (No. NBER Working Papers 3914). https://www.nber.org/papers/w3914

Halkos, G., & Paizanos, E. (2013). The Effect of Government Expenditure on the Environment: An Empirical Investigation. *Ecological Economics*, *91*, 48-56. https://doi.org/10.1016/j.ecolecon.2013.04.002

Halkos, George. (2012). *The Impact of Government Expenditure on the Environment: An Empirical Investigation* (No. MPRA 39957). https://doi.org/10.1016/j.ecolecon.2013.04.002

Harun, M. H. S., Taha, Z., & Salaam, H. A. (2013). Sustainable Manufacturing: Effect of Material Selection and Design on the Environmental Impact in the Manufacturing Process. In *2nd International Conference on Mechanical Engineering Research (ICMER 2013) 1-4 July 2013, Kuantan, Pahang, Malaysia*.

He, J., & Wang, H. (2012). Economic Structure , Development Policy and Environmental Quality : An Empirical Analysis of Environmental Kuznets Curves with Chinese Municipal Data. *Ecological Economics*, 49-59. https://doi.org/10.1016/j.ecolecon.2012.01.014

Hoque, A., Mohiuddin, M., & Su, Z. (2018). Effects of Industrial Operations on Socio-Environmental and Public Health Degradation: Evidence from a Least Developing Country (LDC). *Sustainability*, *10*. https://doi.org/10.3390/su10113948

Islam, M. Z., Ahmed, Z., Saifullah, M. K., Huda, S. N., & Al-Islam, S. M. (2017)."CO₂ Emission, Energy Consumption and Economic Development: A Case of Bangladesh." *The Journal of Asian Finance, Economics and Business 4*: 61-66.https://doi.org/ 10.13106/jafeb.2017.vol4.no4.61

Ivanova, D., Stadler, K., Steen-Olsen, K., Wood, R., Vita, G., Tukker, A., & Hertwich, E. G. (2015). Environmental Impact Assessment of Household Consumption. *Journal of Industrial Ecology*, *20*(3), 526-536. https://doi.org/10.1111/jiec.12371

Linder, A. (2017). Explaining Shipping Company Participation in Voluntary Vessel Emission Reduction Programs. *Transportation Research Part D: Transport and Environment*. https://doi.org/ 10.1016/j.trd.2017.07.004

Lindstad, H. E., & Eskeland, G. S. (2016). Environmental regulations in shipping: Policies leaning towards globalization of scrubbers deserve scrutiny. *Transportation Research Part D: Transport and Environment*, *47*(2016), 67–76. https://doi.org/10.1016/j.trd.2016.05.004

Lee, Jung Wan, and Ahmad Mujafar Syah. 2018. "Economic and Environmental Impacts of Mass Tourism on Regional Tourism Destinations in Indonesia. *The Journal of Asian Finance, Economics and Business*, *5*(3): 31-41. https://doi.org/10.13106/jafeb.2018.vol5.no3.31

Lopez, R, Galinato, G., & Islam, F. (2011). Fiscal Spending and the Environment: Theory and Empirics. *Journal of Environmental Economics and Management*, *62*, 180-196. https://doi.org/10.1016/j.jeem.2011.03.001

Lopez, RE, & Palacios, A. (2010). *Have Government Spending and Energy Tax Policies Contributed to Make Europe Environmentally Cleaner?* (No. Working Paper 94795). Maryland.

Mohammed Saud M., A., Guo, P., Haq, I. ul, Pan, G., & Khan, A. (2019). Do government expenditure and financial development impede environmental degradation in Venezuela? *PLoS ONE*, *14*(1), 1-13. https://doi.org/10.1371/journal.pone.0210255

Ng, A. K. Y., Zhang, H., Afenyo, M., Becker, A., Cahoon, S., Chen, S. ling, Acciaro, M. (2018). Port Decision Maker Perceptions on the Effectiveness of Climate Adaptation Actions. *Coastal Management*, *46*(3), 148-175. https://doi.org/10.1080/08920753.2018.1451731

Parmawati, R., & Kurnianto, A. S. (2019). Features, Innovation, and Environmental Sustainability of Mayangan Fish Port, Probolinggo, Indonesia: An analysis of MDS. *IOP Conference Series: Earth and Environmental Science*, *239*(1). https://doi.org/10.1088/1755-1315/239/1/012037

Perman, P., Ma, Y., McGilvray, J., & Common, M. (2003). *Natural Resource and Environmental Economics*. Harlow: Pearson Education.

Rahman, M. M. (2020). Environmental Degradation: The Role of Electricity Consumption, Economic Growth and Globalisation. *Journal of Environmental Management*, *253*(November 2018), 109742. https://doi.org/10.1016/j.jenvman.2019.109742

Shahbaz, M., Khan, S., Ali, A., & Bhattacharya, M. (2017). The Impact of Globalization on CO₂ Emissions in China. *Singapore Economic Review*, *62*(4), 929-957.

https://doi.org/10.1142/S0217590817400331

Shivashankara, G. P., & Siddegowda. (2011). Household Environmental Problems in Developing Countries. *WIT Transactions on Ecology and He Environment, 153*, 287-298.

Singh Sankhla, M., Kumari, M., Nandan, M., & Mohril, S. (2016). Effect of Electronic waste on Environmental & Human Health- A Review. *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT), 10*(9), 98–104. https:// doi.org/10.2495/WS110261

Stern, D. I. (2004). The Rise and Fall of the Environmental Kuznets Curve. *World Development, 32*(8), 1419-1439. https://doi.org/10.1016/j.worlddev.2004.03.004

Suparmoko, M. (2000). *Ekonomi Sumber Daya Alam dan Lingkungan*. Yogyakarta: BPEE.

Tahereh Alavi Hojjat. 2014. "Economic Impacts of Energy Development on Domestic Economy." *Journal of Asian Finance, Economics and Business 1*(1): 41-45. https://doi.org/10.13106/jafeb.2014.vol1.no1.41.

Tietenberg, T., & Lewis, L. (2012). *Environmental & Natural Resource Economics 9th Edition*. London: Pearson Education

Limited.

Wang, Y., & Chuang, Y. (2011). Environmental Resilience and Economic Growth : Command Economy â€TM s Optimization and Environmental Kuznets Curve. *Economic Modelling, 28*(6), 2854-2861. https://doi.org/10.1016/j.econmod.2011.06.028

World Bank. (2018). *Indonesia - Marine debris hotspot rapid assessment: synthesis report (English)*. Washington, D.C.: World Bank Group. http://documents.worldbank.org/curated/en/983771527663689822/Indonesia-Marine-debris -hotspot-rapid-assessment-synthesis-report

World Bank. 2020. Indonesia Economic Prospects : Towards a Secure and Fast Recovery. Australia. https://www.worldbank.org/en/country/indonesia/publication/indonesia-economic-prospect.

Yang, Z., Ng, A. K. Y., Lee, P. T. W., Wang, T., Qu, Z., Sanchez Rodrigues, V., Lau, Y. yip. (2018). Risk and cost evaluation of port adaptation measures to climate change impacts. *Transportation Research Part D: Transport and Environment, 61*, 444-458. https://doi.org/10.1016/j.trd.2017.03.004

Environmental Quality in Indonesia: Disruption by Economic Agents