Fitriyah, Nur

Article

Financial development and environmental degradation in Indonesia : evidence from auto regressive distributed lag bound testing method

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Financial Development and Environmental Degradation in Indonesia: Evidence from Auto Regressive Distributed Lag Bound Testing Method

Nur Fitriyah*

Department of Public Policy, Faculty of Social Sciences and Politics, Mulawarman University, Samarinda, Indonesia.
*Email: fitunsmul@gmail.com

ABSTRACT

Financial sector can carry a negative impact on power consumption by advancing energy efficient technologies through technological advancements in the power industry to decline toxic carbon emanations. Therefore, the emphasis of the current investigation is on identifying the empirical connection between financial advancement and carbon emission in the developing country of Indonesia. In addition, given the relevant significance, the study also aims to examine the contribution of energy consumption and economic growth of Indonesia in influencing environmental degradation in the country. The results of Auto Regressive Distributed Lag bound testing confirm a valid long-run relationship between financial advancement, energy consumption, economic growth, and carbon dioxide emission in Indonesia. The result further suggested that financial advancement, energy consumption, and economic growth have a positive and significant impact on carbon emission in both the long and short run period. The study recommends that the government needs to divert its energy and also financial institution toward the green investment and environmental friend energy utilization, which ultimately help to reduce the carbon emission level in Indonesia.

Keywords: Financial Advancement, Energy Consumption, Auto Regressive Distributed Lag, Indonesia
JEL Classifications: G00, Q50

1. INTRODUCTION

Given the significant decline in environmental conditions, economies all around the World are cautious about adopting policies that can improve environmental quality (Lohnert and Geist, 2018; Ramuhulu and Chiranga 2018). However, the trends of global economic appraisals showed that the process of advancement is mostly accompanied with environmental degradation (Brown et al., 1997; Tamazian et al., 2009; Tang and Tan, 2014; He et al., 2017; Roy and Prasanna, 2018; He et al., 2019). The fast increment in ozone depletion and other harmful emanations such as, CO_2 discharge, are among the serious issues that the world is confronting, particularly over the previous four decades. This has grabbed the focus of numerous studies

to examine the determinants of CO_2 emanation during several advancement processes. In particular, energy dependence, trade, urban advancement, and output are among the vital causes of decreasing environmental health (Omri et al., 2015). It is commonly realized that examination exploring the connection among them and degradation utilizing distinctive econometric methods have been abundantly studied.

However, many scholars suggested that the association of financial advancement is also crucial for analyzing deteriorating environments. While the numbers of such studies are relatively limited, but they reported ambiguous findings (Al-Mulali et al., 2015; Samaila, et al., 2018). A strand of literature, in this regard, have reported the positive connection between the variables

suggesting that increase in financial advancements is accompanied with augmented power utilization and pollution levels (Sadorsky, 2010; 2011; Zhang, 2011; Islam et al., 2013; Çoban and Topcu, 2013; Tang and Tan, 2014; Shahzad et al., 2017; Rasiah et al., 2018; Salahuddin et al., 2018; Sekali and Bouzahzah, 2019; Tsaurai, 2019). On the opposite end, there also exist some studies that concluded the negative association between financial advancements, power utilization and emission indicating that the improvements in country's financial aspect have the ability to decline the levels of energy and environmental degradation (Phong, 2019; Saidi and Mbarek, 2017; Shahbaz et al., 2013; Jalil and Feridun, 2011; Tamazian and Rao, 2010). Moreover, the study of Ozturk and Acaravci (2013) established the insignificant relationship between a country's levels of financial advancement and carbon emanations. Henceforth, there occur vast uncertainty in academia concerning the exact link between financial advancement and environmental degradation.

The potential connection between financial advancements and environmental is regulated by energy usage. The financial sector can carry a negative impact on power consumption by advancing energy efficient technologies through technological advancements in the power industry to decline toxic carbon emanations. On the other hand, the positive association among the variables is channeled by the advancements in the financial sector that encourage carbon emanations by assisting manufacturing activities (Jensen, 1996). Financial advancement may, for the most part, help innovative work (R and D) exercises and successively improve monetary tasks, and consequently, impact ecological quality (Frankel and Romer, 1999). The stated association is most likely existed in emerging economies (Frankel and Rose, 2002) and explicitly in Indonesia (Shahbaz et al., 2013; Sani et al., 2017). In this way, financial advancements pertains a substantial role in examining environmental literature, and the avoidance of financial improvement in studying environmental degradation may prompt exclusion of a significant variable in the empirical investigations.

Therefore, the emphasis of the current investigation is on identifying the empirical connection between financial advancement and carbon emission in the developing country of Indonesia. In addition, given the relevant significance, the study also aims to examine the contribution of energy consumption and economic growth of Indonesia in influencing environmental degradation in the country. The trend of energy utilization has indicated the rise in power consumption (kg of oil equivalent per capita) in Indonesia from 866.50 in the year 2010 to 884 in the year 2014. Similarly, trends of carbon emanations (metric tons per capita) are also increased from 0.40 in 1975 to 1.82 in 2014. As of late, the Indonesian government has started to focus on the advancement of green approaches and affirmed the decrease of Indonesian carbon discharges by 26% in 2020, the biggest outright decrease responsibility made by an emerging nation (Shahbaz et al., 2013). Hence, under the current scenario, the investigation on the relationship of Indonesian carbon emission with relevant variables is commendable for a thorough examination.

The rest of the study is outlined below. Section two will present a review of the existing literature. Section three will present a description of the method. Section four will present an analysis of empirical investigation and the derived results. Section five will finally conclude the examination by providing findings summary and future implications of the results.

2. LITERATURE REVIEW

The relationship between financial advancement and environmental degradation has been the center of attention in recent environmental literature (Haseeb et al., 2018; Khan et al., 2018; Ozatac et al., 2017). In this regard, the findings of relevant literature have documented mixed outcomes and thus failed to reach a consensus. Among these investigations, Tamazian and Rao (2010) examined the association between financial advancements and ecological deterioration. The study utilized the data of twenty-four emerging nations from the period of 1993 to 2004. The authors measured environmental deterioration with the levels of carbon emission. The outcomes of the empirical investigation reported the significant relationship of financial advancements with carbon emission. In particular, the results reported the negative impact of financial advancement on ecological degradation, indicating that an increase in financial advancements decreased the levels of carbon emanation in the sampled economies.

On the other hand, Tang and Tan (2014) also analyzed the association between foreign investment and ecological deterioration. The study utilized the data of Malaysian economy from the period of 1972 to 2009. The authors measured environmental deterioration with the levels of carbon emission. The outcomes of the empirical investigation reported the significant relationship of foreign investment with carbon emission. In particular, the results reported the positive impact of the country's foreign investments on ecological degradation, indicating that an increase in financial advancements enhanced the levels of carbon emanation in Malaysia.

Similarly, Çoban and Topcu (2013) examined the association between financial advancements and energy dependence. The study utilized the data of twenty-seven European from the period of 1990 to 2011. The outcomes of the empirical investigation reported the significant relationship of financial advancements with energy utilization. In particular, the results reported the positive impact of financial advancement on energy consumption, indicating that an increase in financial advancements enhanced the levels of energy usage in the sampled economies.

Contrarily, Jalil and Feridun (2011) investigated the association between financial advancements and ecological deterioration. The study utilized the data of the Chinese economy from the period of 1953 to 2006. The authors measured environmental deterioration with the levels of carbon emission. The outcomes of the empirical investigation reported the significant relationship of financial advancements with ecological pollution. In particular, the results reported the negative impact of financial advancement on ecological degradation, indicating that an increase in financial advancements reduced the levels of carbon emanation in China.

In another study, Zhang (2011) also examined the association between financial advancements and ecological deterioration.

The study utilized the data of twenty-four emerging nations from the period of 1980 to 2009. The authors measured environmental deterioration with the levels of carbon emission. The outcomes of the empirical investigation reported the significant relationship of financial advancements with carbon emission. However, unlike Jalil and Feridun, (2011), the results reported the positive impact of financial advancement on ecological degradation, indicating that an increase in financial advancements enhanced the levels of carbon emanation in China.

Similarly, Islam et al. (2013) examined the association between financial advancements, output growth, and energy dependence. The study utilized the data of Malaysian economy from the period of 1971 to 2008. The outcomes of the empirical investigation reported the significant relationship between financial advancements and economic advancement with energy utilization. In particular, the results reported the positive impact of financial and economic advancement on energy consumption, indicating that an increase in both variables enhanced the levels of energy usage in Malaysia. Similar results were reported in the study of Sadorsky (2010) for developing nations and Sadorsky (2011) for Central and Eastern European countries.

Moreover, Shahbaz et al. (2013) investigated the association between financial advancements and ecological deterioration. The study utilized the quarterly data of the Indonesian economy from the period of 1975 to 2011. The authors measured environmental deterioration with the levels of carbon emission. The outcomes of the empirical investigation reported the significant relationship of financial advancements with carbon emission. In particular, the results, similar to Jalil and Feridun, (2011) reported the negative influence of financial advancement on ecological degradation indicating that increase in financial advancements reduced the levels of carbon emanation in Indonesia.

Similarly, in a panel study, Saidi and Mbarek (2017) examined the association between financial advancements and ecological deterioration. The study utilized the data of nineteen emerging nations from the period of 1990 to 2013. The authors measured environmental deterioration with the levels of carbon emission. The outcomes of the empirical investigation reported the significant relationship of financial advancements with carbon emission. In particular, the results reported the negative impact of financial advancement on ecological degradation, indicating that an increase in financial advancements decreased carbon emanation in the sampled economies.

On the other hand, Shahzad et al. (2017) analyzed the association between financial advancements and ecological deterioration. The study utilized the data of Pakistani economy from the period of 1971 to 2011. The authors measured environmental deterioration with the levels of carbon emission. The outcomes of the empirical investigation applying Auto Regressive Distributed Lag (ARDL) methods reported the significant relationship of financial advancements with carbon emission. In particular, the results reported the positive impact of financial advancement on ecological degradation, indicating that an increase in financial advancements enhanced the levels of carbon emanation in Pakistan.

Likewise, Salahuddin et al. (2018) assessed the association between output advancement, energy utilization, financial advancements, and ecological deterioration. The study utilized the data of the Turkish economy from the period of 1980 to 2013. Applying ARDL methods, the outcomes of the empirical investigation reported the significant relationship between output advancement, energy utilization, and financial advancements with carbon emission. In particular, the results reported the positive impact of the studied variables on ecological degradation, indicating that an increase in financial advancements enhanced the levels of carbon emanation in Turkey.

In a panel investigation, Al-Mulali et al. (2015) examined the association between financial advancements and ecological deterioration. The study utilized the data of 129 nations based on their income levels from the period of 1980 to 2011. The authors measured environmental deterioration with the levels of carbon emission. The outcomes of the empirical investigation, applying DOLS method reported the significant relationship of financial advancements with carbon emission. In particular, the results reported the negative impact of financial advancement on ecological degradation, indicating that an increase in financial advancements decreased the levels of carbon emanation in the sampled economies.

In another study, Ozturk and Acaravci (2013) analyzed the association of financial advancements and energy utilization with ecological deterioration. The study utilized the data of the Turkish economy from the period of 1960 to 2007. The authors measured environmental deterioration with the levels of carbon emission. The outcomes of the empirical investigation reported the significant relationship of energy utilization with carbon emission. In particular, the results reported the positive impact of energy utilization on ecological degradation, indicating that an increase in energy usage enhanced the levels of carbon emanation. On the other hand, the results of financial advancement are found insignificant to influence levels of ecological degradation in Turkey.

A remarkable study is done by Charfeddine and Kahia (2019) investigated the effect of financial advancement and renewable energy on CO_2 and economic advancement by using a panel data of 24 Middle East and North Africa (MENA) counties over the period of 1980-2015. The study applied panel vector autoregressive framework to investigate the effect of financial advancement and renewable energy initially on carbon emission and then on economic activity. The results of panel estimation confirm that renewable energy and financial advancement both are still in a weak position concerning significant contribution to economic advancement and environmental quality in MENA countries. The study further recommended that policymakers should focus on green and efficient energy usage to reduce environmental issues and improve economic activity in MENA countries.

3. METHODOLOGY

The present work looks at the association between carbon emission, financial advancement, economic growth and energy

consumption by utilizing the Environmental Kuznets Curve model, and the system is given underneath:

$$CO_{2t} = \beta_0 + \beta_1 (Y_t) + \beta_2 (Y_t^2) + \beta_3 (FD_t) + \beta_4 (EC_t) + \varepsilon_t$$

Where ε_t is the residual term, CO_2 signifies the carbon emission, which is calculated in Kilotons of oil equivalent. FD explains the financial advancement, which is calculated in domestic credit to the private sector (Percentage of GDP), EC denotes the energy consumption, which is calculated the total primary energy consumption. Moreover, Y specifies the output which is explained by the all final finished services and goods (in US dollars). Finally, Y^2 is the square of the output growth. The data is collected over the time period of 1981-2017. The entire information is collected from the World Development Indicators. Finally, the entire information is converted in natural logarithmic series as it provides more accurate results (Abidin et al., 2015; Afshan et al., 2018; Seddighi and Yoon, 2018).

To confirm the stationary features for a long-term association of considered time series data, the present examination utilizes Augmented Dickey-Fuller (ADF) and Philip Perron (PP) unit root tests. Additionally, the present examination likewise assessed the data at first on a level and later on the first differential for every single factor. On the other hand, to inspect the role of financial advancement, economic activity and energy consumption in Environmental Kuznets Curve in Indonesia, the present examination applied ARDL system of long-term affiliation which was presented by Pesaran and Pesaran (1997), Pesaran and Shin (1999), Pesaran et al. (2001; 2000) is utilized with the assistance of unhindered vector error modification model to investigate the long-term relationship among different factors. The previously mentioned technique has a couple of focal points on past long-run affiliation examines (like Johansen and Juselius Cointegration and further). This technique could be important regardless of whether considered time series are absolutely I(0), I(1) or correspondingly integrated. The auto distributed lag structure is estimated for the investigation is as per the following:

$$\Delta CO_2 = \varphi_1 \sum_{i=1}^{p} CO_{2t-1} + \varphi_2 \sum_{i=1}^{p} Y_{t-1} + \varphi_3 \sum_{i=1}^{p} Y_{t-1}^2 + \varphi_4 \sum_{i=1}^{p} FD_{t-1} +$$

$$\varphi_5 \sum_{i=1}^{p} EC_{t-1} + \gamma_1 CO_{2t-1} + \gamma_2 Y_{t-1} + \gamma_3 Y_{t-1}^2 + \gamma_4 FD_{t-1} + \gamma_5 EC_{t-1} + \mu_t$$

Where, φ_0 is a constant term, and μ_t is the residual term, the error correction term is disclosed by the sign of summation; however, the other portion of the calculation relates to a long-run affiliation. The Schwarz Bayesian Criteria (SBC) is utilized to take a maximum lag

length decision for each factor. In addition, in the ARDL technique, the present examination figures the F-estimations significance by applying the fitting ARDL frameworks. Following, the Wald (F-details) test is utilized to look at the long-run relationship among the variables. On the other hand, ifa long-run association is found between financial advancement, energy consumption, economic growth, and carbon emission; at that point, the present investigation assessed the long-term coefficients utilizing the accompanying structure:

$$CO_{2t} = \zeta_0 + \zeta_1 \sum_{i=1}^{p} CO_{2t-1} + \zeta_2 \sum_{i=1}^{p} Y_{t-1} + \zeta_3 \sum_{i=1}^{p} Y_{t-1}^2 + \zeta_4 \sum_{i=1}^{p} FD_{t-1} +$$

$$\zeta_5 \sum_{i=1}^{p} EC_{t-1} + \mu_t$$

Next, if a long-run association between energy consumption, financial advancement, economic activity and carbon outflow are found with verification, then we measure the short run sigma value by utilizing the following system:

$$CO_{2t} = \delta_0 + \delta_1 \sum_{i=1}^{p} CO_{2t-1} + \delta_2 \sum_{i=1}^{p} Y_{t-1} + \delta_3 \sum_{i=1}^{p} Y_{t-1}^2 + \delta_4 \sum_{i=1}^{p} FD_{t-1}$$

$$+ \delta_5 \sum_{i=1}^{p} EC_{t-1} + nECT_{t-1} + \mu_t$$

The error correction model demonstrate the swiftness of modification permit to quantify the long-run symmetry because of a short run movement. Then is the coefficient of error correction term in the framework that determines the swiftness of modification (Sharif et al., 2017).

4. DATA ESTIMATION AND INTERPRETATION

The present unit clarifies the data examination. Fundamentally, we used a stationary test to avow the stationary properties of the taken variables. The results of the unit root test are exhibited in Table 1. In this investigation, we utilized two different unit root tests to be explicit ADF and PP test to affirm the stationary highlights of the variables. The revelations assert that financial advancement, economic activity, energy consumption, and carbon outflow at first are non-stationary at a series of level information, also, become stationary at a progression of first differentials. In an essential manner, from the results of the unit root test, the present investigation can construe that information of the impressive

Table 1: Results of Unit root test

Variables	ADF Unit root test				PP unit root test			
	I (0)		I (1)		I (0)		I (1)	
	C	C and T	C	C and T	C	C and T	C	C and T
CO_2	1.453	1.382	−4.554	−4.211	1.033	0.994	−4.325	−4.642
Y	0.328	0.365	−5.213	−5.162	0.339	0.385	−5.442	−5.292
FD	−0.595	−0.581	−6.322	−6.118	−0.261	−0.226	−6.438	−5.925
EC	0.858	0.831	−4.383	−4.184	0.772	0.801	−4.485	−4.857

Source: Authors' Estimations. The critical values for ADP and PP tests with constant (C) and with constant and trend (C and T) 1%, 5% and 10% level of significance are −3.711, −2.981, −2.629 and −4.394, −3.612 and −3.243 respectively. ADP: Augmented Dickey-Fuller, PP: Philip Perron

Table 2: Results of Bound Testing for Cointegration

Lags order	AIC	HQ	SBC	F-test statistics
0	−3.325	−3.476	−3.093	65.264*
1	−4.499*	−4.293*	−4.039*	
2	−4.049	−4.118	−4.004	
3	−3.832	−3.495	−3.953	

Source: Authors' estimation. *1% level of significant. SBC: Schwarz Bayesian Criteria

Table 3: Results of lag length selection

Lag	0	1	2	Nominated Lags
	SBC	SBC	SBC	SBC
CO_2	−1.484	−3.218*	−2.386	1
Y	−1.811	−3.992*	−2.859	1
FD	−1.494	−2.362*	−1.463	1
EC	−1.904	−3.785*	−1.338	1

Source: Authors' estimation. *indicate minimum SBC values. SBC: Schwarz Bayesian Criteria

number of elements emulate the stationary highlights and allows to reports the long-term assessments.

In addition, to investigate the long run association between economic growth, financial advancement, energy consumption and carbon emanation in Indonesia, the present examination associated the strategy for ARDL procedure for cointegration (ARDL). In order to achieve, the essential stage is to identify the maximum lag estimation of the significant number of variables. The order of this loaded estimation is picked by giving principles of SBC. Henceforth, the consequence of the ARDL bound testing cointegration has appeared Table 2.

The results of Table 2 confirm the refusal of no association among the variables it won't. This is a result of the estimation of the F-test statistics are greater than UBC value at 1% significance level. In this way, it is in support of affirmation of the other speculation which recommends that there is a significant long-run affiliation happen among financial advancement, economic growth, energy consumption, and carbon outflow in Indonesia. The consequence of lag length selection is presented in Table 3.

The results of bound testing, thus, affirm the intensity of accomplished results. It is demonstrated that an enormous long-run association exists among economic growth, carbon discharge, financial advancement and economic growth in Indonesia. Also, subsequent to confirming the verification of the long-term relationship between the engaged variables, the further part of the examination is to utilize the model with the purpose of a result of the coefficient estimation of the long-short run period. As to achieve, the present examination appraises the lag estimation sequence of all factors done by the lesser estimation of SBC.

The long-term results of ARDL method have appeared Table 4. The disclosures henceforth set up that economic growth, financial advancement, energy consumption are the critical determinants of carbon discharge in Indonesia. In like manner, the results confirm that financial advancement has a positive and huge impact on carbon outflow in Indonesia, which infers that as more the financial advancement produce more prominent carbon discharge in the nation. Moreover, the results further suggested that economic activity also

Table 4: Results using ARDL approach (Long Run)

Variables	Coeff.	t-stats	Prob.
C	0.294	4.434	0.000
$CO_2(−1)$	−0.113	−3.894	0.000
Y	0.493	3.449	0.000
$Y(−1)$	0.077	3.039	0.000
Y^2	−0.194	−5.225	0.000
$Y^2(−1)$	−0.006	−0.932	0.350
FD	0.394	−6.219	0.000
$FD(−1)$	−0.148	−1.452	0.148
EC	0.395	5.234	0.000
$EC(−1)$	0.295	5.426	0.000
Adj. R^2		0.944	
D.W stats		2.098	
F-stats (Prob.)		2494.436 (0.000)	

Source: Authors' estimation. ARDL: Auto Regressive Distributed Lag

Table 5: Results using ARDL approach (Short Run)

Variables	Coeff.	t-stats	Prob.
C	0.209	2.588	0.010
$\Delta CO_2(−1)$	0.328	4.314	0.000
ΔY	0.413	4.467	0.000
$\Delta Y(−1)$	0.026	1.395	0.175
ΔY^2	−0.382	−4.183	0.000
$\Delta Y^2(−1)$	−0.193	−3.998	0.000
ΔFD	0.384	5.032	0.000
$\Delta FD(−1)$	0.158	4.593	0.000
ΔEC	0.329	3.958	0.000
$\Delta EC(−1)$	0.194	3.332	0.000
Error correction model (1)	−0.321	−4.313	0.000
Adj. R^2		0.932	
D.W stats		2.043	
F-stats (Prob.)		1043.334 (0.000)	

Source: Authors' estimation. ARDL: Auto Regressive Distributed Lag

have a significant and positive effect on carbon dioxide emission. Next, the consequences of ARDL additionally affirm that square of economic advancement is assuming a critical factor to diminish the CO_2 in Indonesia, which affirm an invert U-Shape EKC curve exhibits in Indonesia. On the other hand, the results of the long-run ARDL test also confirm that energy consumption also has a positive and significant impact on carbon dioxide emission in Indonesia. At last, the results of EKC curve and financial advancement increase carbon emission at the starting of economy upgradation in the country anyway later getting the huge advancement, it diminishes the environmental degradation in the case of Indonesia.

The short-run results of ARDL method are revealed in Table 5. The findings comprehensive a valid short run connection between economic growth, financial advancement, energy consumption, and carbon emission in Indonesia. The value of the error term is representing the estimation of around −0.321 recommend that around 32.1% of changeability is attuned in the current year. Furthermore, the findings similarly confirm the noteworthy effect of energy consumption and financial advancement on carbon outflow in Indonesia in short running also.

5. CONCLUSION AND DISCUSSION

Nowadays, the trends of global economic appraisals showed that the process of advancement is mostly accompanied by

environmental degradation. The fast increment in ozone depletion and other harmful emanations such as, CO_2 discharge, are among the serious issues that the world is confronting, particularly over the previous four decades. This has grabbed the focus of numerous studies to examine the determinants of CO_2 emanation during several advancement processes. Energy dependence, trade, urban advancement, and output are among the vital causes of decreasing environmental health. It is commonly realized that examination exploring the connection among them and degradation utilizing distinctive econometric methods have been abundantly studied. In connection with this, the potential connection between financial advancements and environmental is regulated by energy usage. The financial sector can carry a negative impact on power consumption by advancing in energy efficient technologies through technological advancements in the power industry to decline toxic carbon emanations. On the other hand, the positive association among the variables is channeled by the advancements in the financial sector that encourages carbon emanations by assisting manufacturing activities. Financial advancement may, for the most part, help innovative work (R and D) exercises and successively improve monetary tasks, and consequently, impact ecological quality.

Many scholars suggested that the association of financial advancement is also crucial for analyzing deteriorating environments. While the numbers of such studies are relatively limited, but they reported ambiguous findings. A strand of literature, in this regard, have reported the positive connection between the variables suggesting that increase in financial advancements is accompanied with augmented power utilization and pollution levels. On the opposite end, there also exist some studies that concluded the negative association between financial advancements, power utilization and emission indicating that the improvements in country's financial aspect have the ability to decline the levels of energy and environmental degradation. The emphasis of the current investigation is on identifying the empirical connection between financial advancement and carbon emission in the developing country of Indonesia. In addition, given the relevant significance, the study also aims to examine the contribution of energy consumption and economic growth of Indonesia in influencing environmental degradation in the country. The results of ARDL bound testing confirm a valid long-run relationship between financial advancement, energy consumption, economic growth, and carbon dioxide emission in Indonesia. The result further suggested that financial advancement, energy consumption, and economic growth have a positive and significant impact on carbon emission in both the long and short run period. The study recommends that the government needs to divert its energy and also financial institution toward the green investment and environmental friend energy utilization, which ultimately help to reduce the carbon emission level in Indonesia.

REFERENCES

Abidin, I.S.Z., Haseeb, M., Azam, M., Islam, R. (2015), Foreign direct investment, financial development, international trade and energy consumption: Panel data evidence from selected ASEAN countries. International Journal of Energy Economics and Policy, 5(3), 841-850.

Afshan, S., Sharif, A., Loganathan, N., Jammazi, R. (2018), Time-frequency causality between stock prices and exchange rates: Further evidence from cointegration and wavelet analysis. Physica A: Statistical Mechanics and its Applications, 495, 225-244.

Al-Mulali, U., Tang, C.F., Ozturk, I. (2015), Does financial development reduce environmental degradation? Evidence from a panel study of 129 countries. Environmental Science and Pollution Research, 22(19), 14891-14900.

Brown, K., Turner, R.K., Hameed, H., Bateman, I.A.N. (1997), Environmental carrying capacity and tourism development in the Maldives and Nepal. Environmental Conservation, 24(4), 316-325.

Charfeddine, L., Kahia, M. (2019), Impact of renewable energy consumption and financial development on CO2 emissions and economic growth in the MENA region: A panel vector autoregressive (PVAR) analysis. Renewable Energy, 139, 198-213.

Çoban, S., Topcu, M. (2013), The nexus between financial development and energy consumption in the EU: A dynamic panel data analysis. Energy Economics, 39, 81-88.

Frankel, J., Rose, A. (2002), An estimate of the effect of common currencies on trade and income. The Quarterly Journal of Economics, 117(2), 437-466.

Frankel, J.A., Romer, D.H. (1999), Does trade cause growth? American Economic Review, 89(3), 379-399.

Haseeb, A., Xia, E., Baloch, M.A., Abbas, K. (2018), Financial development, globalization, and CO_2 emission in the presence of EKC: Evidence from BRICS countries. Environmental Science and Pollution Research, 25(31), 31283-31296.

He, C., Gao, B., Huang, Q., Ma, Q., Dou, Y. (2017), Environmental degradation in the urban areas of China: Evidence from multi-source remote sensing data. Remote Sensing of Environment, 193, 65-75.

He, F.S., Gan, G.G.G., Al-Mulali, U., Solarin, S.A. (2019), The influences of economic indicators on environmental pollution in Malaysia. International Journal of Energy Economics and Policy, 9(2), 123-131.

Islam, F., Shahbaz, M., Ahmed, A.U., Alam, M.M. (2013), Financial development and energy consumption nexus in Malaysia: A multivariate time series analysis. Economic Modelling, 30, 435-441.

Jalil, A., Feridun, M. (2011), The impact of growth, energy and financial development on the environment in China: A cointegration analysis. Energy Economics, 33(2), 284-291.

Jensen, A.L. (1996), Beverton and Holt life history invariants result from optimal trade-off of reproduction and survival. Canadian Journal of Fisheries and Aquatic Sciences, 53(4), 820-822.

Khan, A.Q., Saleem, N., Fatima, S.T. (2018), Financial development, income inequality, and CO 2 emissions in Asian countries using STIRPAT model. Environmental Science and Pollution Research, 25(7), 6308-6319.

Lohnert, B., Geist, H., editors. (2018), Coping with Changing Environments: Social Dimensions of Endangered Ecosystems in the Developing World. US: Routledge.

Omri, A., Daly, S., Rault, C., Chaibi, A. (2015), Financial development, environmental quality, trade and economic growth: What causes what in MENA countries. Energy Economics, 48, 242-252.

Ozatac, N., Gokmenoglu, K.K., Taspinar, N. (2017), Testing the EKC hypothesis by considering trade openness, urbanization, and financial development: The case of Turkey. Environmental Science and Pollution Research, 24(20), 16690-16701.

Ozturk, I., Acaravci, A. (2013), The long-run and causal analysis of energy, growth, openness and financial development on carbon emissions in Turkey. Energy Economics, 36, 262-267.

Pesaran, M.H., Pesaran, B. (1997), Working with Microfit 4.0: Interactive Econometric Analysis; [Windows Version]. Oxford: Oxford University Press.

Pesaran, M.H., Shin, Y., Smith, R.J. (2000), Structural analysis of vector

error correction models with exogenous I (1) variables. Journal of Econometrics, 97(2), 293-343.

Pesaran, M.H., Shin, Y., Smith, R.J. (2001), Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289-326.

Pesaran, M.H., Shin, Y., Smith, R.P. (1999), Pooled mean group estimation of dynamic heterogeneous panels. Journal of the American Statistical Association, 94(446), 621-634.

Phong, L.H. (2019), Globalization, financial development, and environmental degradation in the presence of environmental Kuznets Curve: Evidence from ASEAN-5 countries. International Journal of Energy Economics and Policy, 9(2), 40-50.

Ramuhulu, M., Chiranga, N. (2018), An investigation into the causes of failures in railway infrastructure at transnet freight rail-a case of the steel and cement business unit. International Journal of Sustainable Development and World Policy, 7(1), 8-26.

Rasiah, R., Guptan, V., Habibullah, M.S. (2018), Evaluating the impact of financial and economic factors on environmental degradation: A panel estimation study of selected Asean countries. International Journal of Energy Economics and Policy, 8(6), 209-216.

Roy, S., Prasanna, K. (2018), Validity of expectation hypothesis: Information content of term structure. Asian Economic and Financial Review, 8(6), 762-774.

Sadorsky, P. (2010), The impact of financial development on energy consumption in emerging economies. Energy Policy, 38(5), 2528-2535.

Sadorsky, P. (2011), Financial development and energy consumption in Central and Eastern European frontier economies. Energy Policy, 39(2), 999-1006.

Saidi, K., Mbarek, M.B. (2017), The impact of income, trade, urbanization, and financial development on CO_2 emissions in 19 emerging economies. Environmental Science and Pollution Research, 24(14), 12748-12757.

Salahuddin, M., Alam, K., Ozturk, I., Sohag, K. (2018), The effects of electricity consumption, economic growth, financial development and foreign direct investment on CO_2 emissions in Kuwait. Renewable and Sustainable Energy Reviews, 81, 2002-2010.

Samaila, M., Uzochukwu, O.C., Ishaq, M. (2018), Organizational politics and workplace conflict in selected tertiary institutions in Edo state, Nigeria. International Journal of Emerging Trends in Social Sciences, 4(1), 26-41.

Sani, I.S., Mukhtar, S., Gani, I.M. (2017), Relationship between electricity consumption, manufacturing output and financial development: A new evidence from Nigeria. Energy Economics Letters, 4(3), 28-35.

Seddighi, H., Yoon, I.H. (2018), Stock market efficiency and price limits: Evidence from Korea's recent expansion of price limits. Asian Journal of Economics and Empirical Research, 5(2), 191-200.

Sekali, J., Bouzahzah, M. (2019), Financial development and environmental quality: Empirical evidence for Morocco. International Journal of Energy Economics and Policy, 9(2), 67-74.

Shahbaz, M., Hye, Q.M.A., Tiwari, A.K., Leitão, N.C. (2013), Economic growth, energy consumption, financial development, international trade and CO_2 emissions in Indonesia. Renewable and Sustainable Energy Reviews, 25, 109-121.

Shahzad, S.J.H., Kumar, R.R., Zakaria, M., Hurr, M. (2017), Carbon emission, energy consumption, trade openness and financial development in Pakistan: A revisit. Renewable and Sustainable Energy Reviews, 70, 185-192.

Sharif, A., Afshan, S., Nisha, N. (2017), Impact of tourism on CO_2 emission: Evidence from Pakistan. Asia Pacific Journal of Tourism Research, 22(4), 408-421.

Tamazian, A., Chousa, J.P., Vadlamannati, K.C. (2009), Does higher economic and financial development lead to environmental degradation: Evidence from BRIC countries. Energy Policy, 37(1), 246-253.

Tamazian, A., Rao, B.B. (2010), Do economic, financial and institutional developments matter for environmental degradation? Evidence from transitional economies. Energy Economics, 32(1), 137-145.

Tang, C.F., Tan, B.W. (2014), The linkages among energy consumption, economic growth, relative price, foreign direct investment, and financial development in Malaysia. Quality and Quantity, 48(2), 781-797.

Tsaurai, K. (2019), The impact of financial development on carbon emissions in Africa. International Journal of Energy Economics and Policy, 9(3), 144-153.

Zhang, Y.J. (2011), The impact of financial development on carbon emissions: An empirical analysis in China. Energy Policy, 39(4), 2197-2203.